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A Methuselah among American Mines

By L. O. Kellogg

SYNOPSIS—The Sterling iron mine, the oldest mine of importance in New York, has operated continuously for over 160 years. It is situated at Lakeville in Orange County, southeastern New York. Is rich in historical associations. The deposit is of magnetite in a gneiss country. The ore is hoisted in a flat inclined shaft and hand-sorted on picking conveyors. The company owns 17,000 acres, including a lake over the mine workings. Substantial stone buildings erected. Electric power chiefly used.

At Lakeville in Orange County, southeastern New York, just north of the New Jersey line, is the Sterling iron mine, the oldest mine of any importance in the state, one of the oldest in the country and certainly the only American mine that has been in continuous operation for over 160 years. Historical associations cluster thick about the property. A bronze tablet erected in the shadow of the old smelting furnace, Fig. 6, reads as follows:

This tablet was erected by the Daughters of the Revolution, State of New York, June 23, 1906, to commemorate the ruins of Sterling Furnace, which was built on this spot in 1751. This furnace is believed to have been the first place in the State of New York in which iron and steel were manufactured in quantity. From the iron here produced was manufactured in 1778 by Peter Townsend, the great chain put across the Hudson River, near West Point, to impede the progress of the British warships up the river; and the first anchor made in New York State was here manufactured in 1773.

In addition to the first anchors made in the state, some of the first cannon were also cast from Sterling iron, and none of these, it is said, failed under test.

History of the Property

The section of New York and New Jersey in which this mine is situated, was first owned under grant by Lord Sterling, who has left his imprint on the nomenclature of the region as witnessed by the many names, such as Sterling Pond, Sterling Forest, Sterlington, etc. The mine was discovered in 1750, and the old smelting furnace referred to above, built of lime masonry and running on charcoal, was erected in 1751. Charcoal smelting was continued until 1848, when an anthracite furnace was erected at Sterling Furnace, farther down the valley. The pig iron made was hauled by wagon to Sloatsburg until 1865, when the railroad was built connecting the mine with the Erie road at Sterlington. The property was in the hands of the Townsend family for over 100 years, and so far as known, has never been

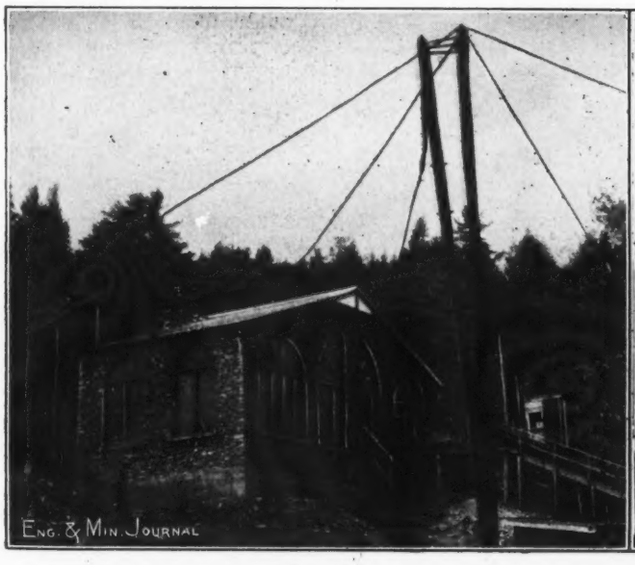

Fig. 1. Hoist House, Derrick, End of Incline and Headframe

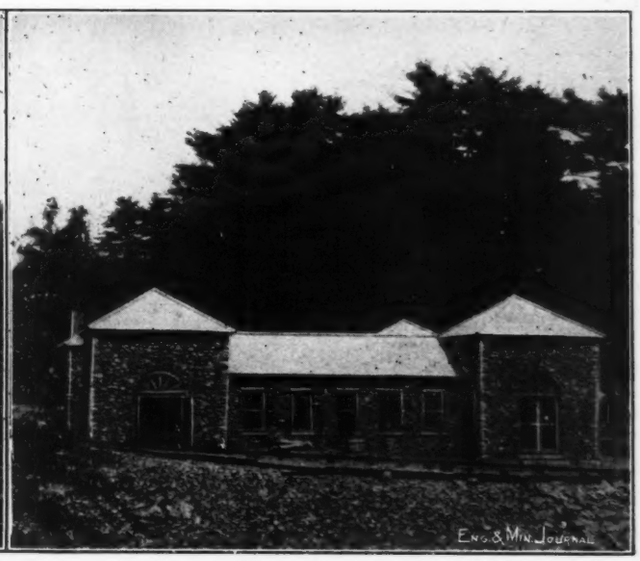

Fig. 2. Offices, Shops and Supply Room

shut down. The operating company now is the Sterling Iron & Ry. Co. The early workings, now looking like a surface cut, have been abandoned and operations are conducted on another deposit, outcropping near the original discovery but having a different strike and dip.

The ore is a magnetite in gneiss. The deposit has a length on its strike of several hundred feet and a thickness varying from nothing up to 20 ft. Its dimension pillars. No timbering worth mentioning is used, the only support of the back being the pillars at rather wide intervals. These pillars are usually left where the foot wall rises so that little ore remains between the two walls. The hanging can be described only as beautiful. In spite of the large areas left unsupported, it is standing intact in most places after several years. The mine has the deserved reputation of being unusually safe. The ventila-

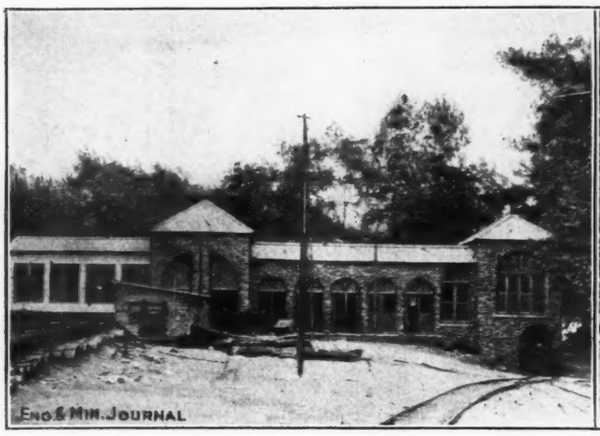

FIG. 3. CRUSHING AND SORTING HOUSE

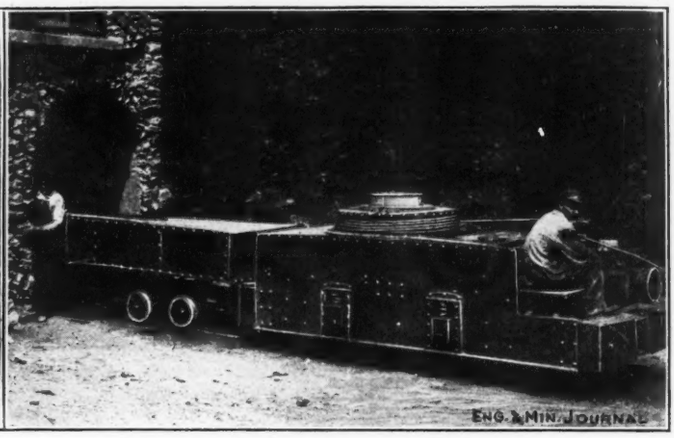

FIG. 4. LOCOMOTIVE WITH GATHERING REEL

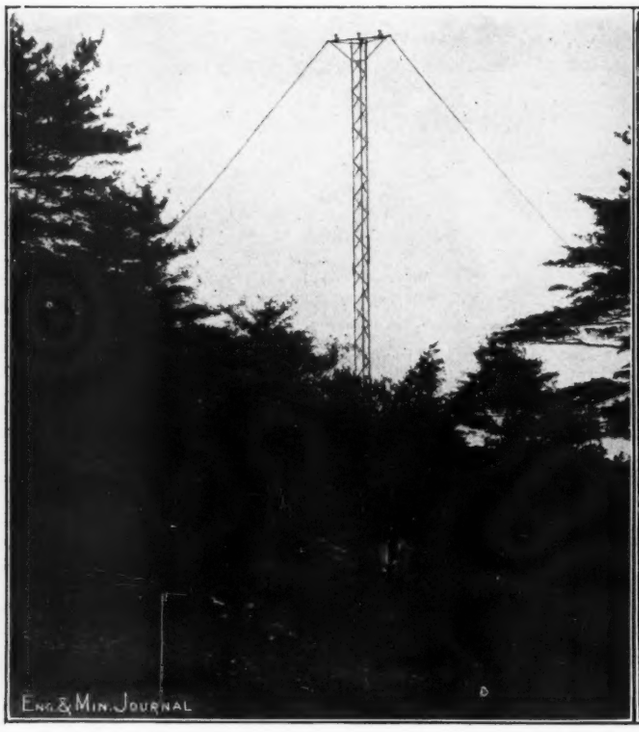

FIG. 5. HIGH LATTICED TRANSMISSION TOWERS

FIG. 6. MONUMENT AND COMMEMORATIVE TABLET

on the dip is not yet determined, as the bottom of the 2650-ft. shaft is still in ore. The strike of the deposit is about northeast and its dip is 18° to 19° to the north. The single shaft in use, lies in the ore and follows the irregular foot wall more or less closely. In places it seems hardly more than an inclined track laid through the stope. A pillar is left on both sides of the tracks, but the frequently spaced levels break through this in many places so as to make it rather a succession of elliptical

tion also is surprisingly good, the circulation of the air being aided by some old openings. The mine is, furthermore, free of dripping water, and the only drawback to the complete enjoyment of life underground lies in the unsanitary habits of the men.

UNDERGROUND METHODS

Drilling is performed with light Ingersoll-Rand machines mounted on tripods, two men, however, being em-

ployed on each machine. The system in general is overhand stoping. The broken ore is mucked out about as fast as it is broken. The good words spoken for the hanging cannot be repeated for the foot wall. The irregular nature of this, with alternating ridges and gulches such as it has, interferes seriously with systematic work and makes mucking exceedingly difficult. The broken ore is shoveled and thrown into 2-ton turntable cars, trammed out over a 30-lb., 3-ft. gage track to the loading platform built across the shaft, dumped into the 4-ton cars or skips and hoisted. Some large waste is sorted out underground. The levels are driven every 30 ft. On the northeast the deposit is faulted off.

Surface Handling of the Ore

The hoisted cars are dumped into a small bin by tripping the door on the lower end. The ore is fed thence to a link-pan conveyor running only 6 or 8 ft. per min. Several ore sorters stand on this and throw lump mag-

Fig. 7. The Lake Overlying the Workings

netite into one car and lump waste into another. The smaller material is fed to a gyratory crusher, and, after crushing, discharged on another inclined belt-conveyor. More ore sorters here discard the broken waste to a small belt paralleling the main belt. The two belts dump into different bins. An electric locomotive, Fig. 4, handles the various products of the sorting and loads the railroad cars. It is a General Electric machine, operating at 220 volts and rated to give a speed of 7.5 miles per hr. with a pull of 2400 lb. It is of an unusual type for surface work, operating with a gathering reel and a cable laid on the ground instead of with a trolley and overhead wires. This makes a flexible system, the cable being paid out and reeled up following the movement of the locomotive, which is thus enabled to go anywhere within the limits of the length of the cable; the three-phase system is probably simpler to handle in this way than by the use of double trolleys, and there is something to be said in its favor on the score of safety.

The discard from the hoisted material amounts to about 25%. The sorted product is a nonbessemer ore of rather high grade, approximating 60%, free of sulphur and a desirable furnace material as being almost self-fluxing. It is shipped all rail to a Pennsylvania furnace. The shipping product is dumped directly from the 2-ton tram cars handled by the electric locomotive into the 45-ton railroad cars, these being backed into a kind of cut, formed by the hill on one side and the dump on the other, and bridged with a sort of trestlework for the tram tracks. The railroad, owned by the company, connects the mine with the station of Sterlington on the Erie. It is eight miles long, and overcomes a difference of elevation to the mine of 400 ft. The maximum grade is 4 per cent.

Power Installation

The electric installation at this mine is extensive. Four sets of electric wires are taken down the shaft, namely, power cable in a lead sheath, a telephone cable, lighting wires and signal wires. The power and telephone cables are supported by clips from guy-wire cables. The power at 2200 volts is used for the main pump, the sinking pump, a pump near the collar to intercept surface water and for the sinking hoist. On the surface the electric power is used for the main hoist, a Lidgerwood double-drum machine, driven by a General Electric three-phase motor; for the picking conveyors; for the crusher and for the locomotive. The only machine not electrified is the compressor, which is a Rand Imperial running on steam generated by anthracite buckwheat. It has two 14x16-in. steam cylinders and two compound air cylinders, 13x16-in. and 22x16-in.

The electric power consumption will run about 200 hp. It is generated at a producer-gas plant on the Erie several miles away, and is brought in at 13,200 volts and stepped down to 2200 and 220 volts for use about the plant. In order to avoid damage to the trees near the mine, the last six or seven transmission poles are built 40 or 50 ft. high and are guyed from the tops. They are constructed of three angles with lattice bracing, as shown in Fig. 5. One would have to go far, probably to Grass Valley, Calif., to find another mine so merciful to a neighboring forest. Apparently no feud with a forest service exists here.

Property and Buildings

The company owns 17,000 acres outright, nearly a township, and includes in its holdings a 350-acre lake. The main shaft and most of the workings lie under this lake, which is 100 ft. deep in places. No one viewing the solid hanging, however, would look for any leakage. Fig. 7, showing the lake, was taken about 300 ft. from the shaft collar. The mine buildings, shown in Figs. 1, 2 and 3, are well built, of local stone, left with a rough finish, and present a most attractive appearance. The large amount of ribbed glass used in their design makes the interiors unusually light. The Journal is indebted to B. M. Moffatt, Jr., general superintendent of the company, for assistance in obtaining the material for this article.

Nickel Smelting and Converting

Limestone is used as a flux in nickel smelting at the Canadian Copper Co.'s works, Copper Cliff, Ont., only when the furnaces are in poor condition, says the *Canadian Mining Journal*, Aug. 1, 1913. Its addition lowers the melting point of the slag, and thus cleans out accretions from the sides of the furnace. If much alumina is present, lime is particularly indicated. The coke used is about 11% of the weight of the charge, and a furnace 17 ft. long, smelting about 300 tons of ore, or 400 tons of charge per day, takes about 24,000 cu.ft.

of blast per minute. The settlers used are oval, 19 ft. 6 in by 16 ft., by 5 ft. 6 in. high.

The slag carries about 33% SiO_2 and 55% Fe, and about 0.04% Cu and Ni. The matte carries about 6% Cu, 16% Ni, 47% Fe, and 27% S. Its specific gravity is 4.6 to 4.8; that of the slag is about 3.7.

The basic converters are 37 ft. long by 10 ft. in diameter. Air is used at 10 ft. pressure, and each converter uses about 6500 ft. of free air per minute.

The matte is blown to a high-grade product carrying about 25% Cu, 55% Ni, 0.5% Fe, 19% of S. The converter slag carries about 28% SiO_2, 62% FeO, and 2½ to 3% Ni. This slag is resmelted as a flux.

In converting, about 70 to 80 tons of matte are poured into the converter and 5000 or 6000 lb. of dry crushed quartz are added. The slag is poured off after about an hour's blowing, and more matte and flux added. After that, slag is poured off and one pot matte with about 5000 lb. of quartz and waste mine rock charged every 40 min. The entire blow lasts from 70 to 80 hours.

Johannesburg Strike

SPECIAL CORRESPONDENCE

When I wrote a fortnight ago, the government had apparently surrendered to the strikers and had, with the consent of the mine owners, agreed that all miners at the New Kleinfontein should be reinstated, and that the free laborers should be removed, the mine owners insisting on their being compensated. The Federation of Trades and the railway men were promised that they would be allowed to place their demands before the government. Before this, neither the government nor the mine owners would recognize the trade unions. The bulk of the men and their leaders considered they had won a great victory and that little trouble would be experienced in gathering in the fruits of it, as they considered that a little rioting and house-burning had cowed and frightened both mine owners and the government.

The real reason that this surrender was made has not, I believe, been published anywhere, and for obvious reasons is not published in South Africa. The truth was that in the compounds of the Central Rand, containing perhaps 40,000 natives, there were food supplies for only a few days, and had the railways joined the strikers, as was certain to take place, a most awful state of affairs would have arisen. The men do not know this, even today, and immediately after the strike was over, started drawing up a list of demands of the various trades that contained requests calculated to render gold production impossible on most of the mines on the Rand. They demanded that the government would immediately call a special session of Parliament to grant a universal eight-hour day with a surface minimum wage for skilled mechanics of 2s. 6d. per hr., with 25s for drill sharpeners and half rates for unskilled laborers. The minimum daily wage for underground skilled workers to be 22s. 6d. for eight hours bank-to-bank, overtime to be paid as time and a half, double pay on Sundays and holidays, and night shift for mechanics to be paid time and a quarter. Power-station men were to work only 40 hours per week and no drill sharpening was to be carried on underground. Tenants in mine houses were to be entitled to one month's notice. Weekly wages to be paid and a fair-wage and conditions clause to be inserted in all foot contracts. The general demands included the abolition of all Sunday work on mines and the prohibition of all important contract labor (aimed at cutting off the supply of native labor), the introduction of wage boards, and other demands, including a mimimum wage for most trades. The railway employees made other demands on the government, many of which are reasonable and which the government has decided to grant. The Transvaal Miners' Association put forward a list of grievances also, of which the most important were the limiting of night shifts to five per week; fixing minimum rates of underground pay; the abolition of discharge notes; that the miners be allowed to elect a third of the mine inspectors, and that two employees act as local inspectors; that compensation for miners' phthisis be increased to $375 for first-stage cases and $750 for advanced cases; that a fortnight's holiday on full pay be granted for each year's service; that Trade Unions be recognized under the law.

The position at date of writing, June 27, is that the government and employers have rejected the bulk of the demands, granting, however, several that are obviously fair and reasonable, and that all arrangements have been made to deal with a general strike. Militia and police have been concentrated on the Rand, special constables nearer in, and every preparation made to deal with disorder among employees. It has been decided to march all the mine natives away from the Rand, and lines of food depots have been established.

The trouble has already led to a cessation of recruiting, and natives are leaving in large numbers for their homes, owing to fear of further troubles. After the miners agreed to resume work, the natives in general compounds attempted to strike work for higher wages and many were severely punished. All these factors are producing a great shortage of native labor, and the mines have already started to discharge miners. If the present state of unrest continues, the output of the Rand must decrease and new work be postponed indefinitely. Apparently the best remedy is for a strike to take place and after a proper trial of strength, peace may be restored. As a matter of fact, the greater number of the mine employees desire no strike. The conditions of work and of pay of the surface employees are the best in the world and 80% of the miners and mine employees who left work, did so owing to moral or physical fear.

United States Quicksilver Production

Low prices prevailed in the quicksilver industry during 1912, and it was not prosperous. Most of the producers are old mines, devoid of high-grade ore, which require special skill in working. Operating costs are not being reduced, and little improvement can be expected with the low market price and uncertainty of ore supplies, says the U. S. Geological Survey. The domestic market appears to require 20,000 to 25,000 flasks yearly.

Final figures show production of 25,064 flasks, of which 20,524 flasks were from California and 4540 flasks from Nevada and Texas. There were 20 mines producing the metal, of which 17 were in California and the other three in Nevada and Texas.

The average recovery of metal from ore in California in 1912 was 11 lb. per ton of ore treated, or 0.55% of the ore. In 1911 the recovery was 0.54% of the ore.

Ore Bedding by the Tennessee Copper Co.

By H. F. Wierum*

SYNOPSIS—In making acid from smelting-works gases, uniformity in gas analysis is a most important factor. This is gained by the bedding system at the Tennessee company's Copperhill plant. Other advantages, such as decreased coke consumption, are also gained.

In making sulphuric acid from the waste gases of blast furnaces when smelting ores high in sulphur, it has been found that the efficiency and economy of the process depends as much upon the furnaces as upon the acid plant. As compared with many periods, sometimes of months' duration, when, by reason of irregular cre analyses, or other conditions, the furnaces have run slowly and irregularly there have been many occasions when with practically no increase in the amount of ore smelted the acid plant has been pushed to its maximum capacity because of the steadiness of the gas and its high SO_2 contents. Ordinarily a copper metallurgist gives but little thought to his escaping gases if his slags are good, his fuel low, his tonnage normal and his grade of matte satisfactory. Of course, when one or more of these items becomes persistently unsatisfactory he will, or should, look to his gases to help point out the reason and remedy.

Gas Grade Sometimes More Important Than Slag Tenor

Attach a huge acid plant to the furnace flues, however, and then tell the metallurgist that the grade of his gas means in reality more in dollars and cents than the copper contents of his slag, and he has one more important and troublesome object in life, one more ever-fruitful subject for telephone calls from his foreman at 2 a.m.; a leaky tap jacket or spout, a runaway on a forehearth, in fact any ordinary bit of hard luck that is but half an incident to the ordinary smelter, becomes a serious matter where it means an interrupted gas supply and the possible upsetting or loss of the acid chamber process, sometimes not recoverable again for a day or two.

The quantity of coke used in blast-furnace smelting is, of course, always an important item of expense and more, the successful husbanding of coke is a matter of pride. To the metallurgist with an acid plant looking to him for good gas it is still more important, for coke plays a star rôle in affecting gas conditions; influencing the temperature of the gases, the grade of matte (which responds to the more or less oxidizing conditions in the furnace), and last, but not least, the percentage volume of CO_2. This inert CO_2 takes space in the chambers, space that might be used for SO_2 and O, and therefore is a dead loss. However, a discussion of the details of acid-making conditions is not the object of this article; suffice it to say that the less CO_2 the better, and as coke is one of the chief sources of CO_2, the less of it the better, provided the gases are hot enough when they reach the Glover towers to cook nitrate of soda, to concentrate the chamber acid, and to denitrate the nitrous vitrol. A good average temperature is 800° to 900° Fahrenheit.

One more point at the Tennessee Copper Co.'s plant, at Copper Hill, Tenn., needs mentioning. The ore supply comes from three mines, differing considerably from each other in analyses, and ofttimes showing widely divergent analyses on successive days in the output from the same mines. For instance, it is not uncommon for 1000 tons from Burra Burra to analyze:

Today, SiO_2, 10%; Fe, 40%; S, 29%.
Tomorrow, SiO_2, 20%; Fe, 35%; S, 24%.

a variation which, if unknown beforehand by the metallurgist, will materially affect the slag, matte and gas product from the furnaces.

Hot Furnace Tops Necessary for Acid Making

In theory and in fact all the items which work toward good metallurgy, with one exception, work also toward good gas conditions, the one exception being the necessity of rather high top temperatures. This requisite makes it difficult, if not impossible, to practice true pyritic smelting.

Digesting all these facts and realizing that, if the acid plant were ever so large it would only make acid in proportion to the grade and quantity of gas supplied to it, and realizing further that both more and cheaper acid can be made from a steady gas carrying say 4½% of SO_2, hour in and hour out, than can be made from an average 5 or 5½% SO_2 gas that is 7% in the morning and 3% in the afternoon, it was decided to bed the ores.

As stated before, two successive days frequently show a variation of 15 or more units in the excess of iron over silica in Burra ore, but, taken by weeks, two successive weeks' averages rarely, if ever, show a quarter of this varition and many weeks' average analyses are practically identical with each other, hence it was argued that a bed holding a week's output would flatten out these fluctuations in analyses from the daily-unit basis to the weekly-unit basis, and so it has done.

Cananea Bedding System Used

The system of bedding and reclaiming ore devised by E. H. Messiter and installed by A. S. Dwight, at Cananea, is too widely known to call for a detailed description here. For climates not too severely cold in winter it probably is the most satisfactory all-around system of handling, say 800 tons per day or upward. Cold weather certainly interferes with the operation, though it would not be impossible to provide a protected steam-heating system along the center of each bed. The first cost of the Copper Hill installation was about $7 per ton of storage. There are two beds holding 7500 tons each, and two smaller ones holding 3000 tons each, a total of 21,000 tons, and the total cost was roughly $150,000, not including the sampling mill. There are two of the large reclaiming machines, which alone cost about $33,000, set up at the plant. All told, there are nearly 3000 ft. of belt conveyors, 6000 ft. of actual belting of all sizes from 30-in. to 16-in. The superstructure itself is of wood instead of steel, as at Cananea. The foundations for the beds are poured slag faced in the trenches between beds with either heavy-braced planking or concrete.

In operation, the ore is brought in trains from the mines and dumped after weighing into any one of a long row of bins, each holding 200 or 400 tons.

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The company railroad cars are longitudinal bottom-dump cars and the track is supported on the bins. Some of these bins are reserved for limestone or quartz or coke, but no effort is made to keep the products of the three mines separated from each other after weighing. It all passes the sampling mill later as "green ore." Three successive cuts are automatically taken at the mill of one-fourteenth, one-fourteenth and one-tenth, each cut being suitably crushed before the next. Lots of the mixed green ore are made of 1000 or 2000 tons each. Care is taken not to have an over-dose of ore from any one mine on a bed, and the analyses of all lots being known (currently while building the bed) quartz or limestone or some one ore is then bedded in calculated proportions to complete the mixture of 7000 or 7500 tons in such a manner as to conform to the exact analysis called for by the desired slag, matte and gas. Last of all, the coke is put on.

The cost of bedding begins when the ore has been dumped from the railroad cars into the bin. A 30-in. belt conveyor runs under the entire row of bins and delivers to the gyratory crusher, the first step in the sampling mill. A two-motion feeder guides the ore from the bin gates to this 30-in. belt. One motion is the travel from bin to bin and the other, a shaking which keeps the ore from blocking the bin gates and delivers it in regular quantities to the belt. Two men, sometimes three, are generally required to operate the shaking feeder. Six or eight men attend to the passage of the ore through the sampling mill, including a final cutting down of the small samples. When the ore leaves the gyratory, which crushes to four or five inches, thirteen-fourteenths of it goes directly to the beds without further crushing.

The rejects from all subsequent cuts also find their way to the main delivery belt, which, by means of a moveable tripper, delivers to the bedding belt over any desired bed. These bedding belts, of which there are two, each one covering a big and a little bed arranged in tandem, are provided with traveling trippers which, in going forward, clutch the belt and travel with it and at the same speed, thus carrying the belt full of ore out to the far end of the beds. At that point an arm on the tripper strikes a stationary dog on the superstructure, which reverses the mechanism and releases the tripper from the belt, so that it (the tripper) starts backward, spilling the ore over its top pulley and down through a spout onto the peak of the bed. The forward movement of the belt is never interrupted, so that the backward movement of the tripper acts as a scraper would act if held down on a conveyor and moved in the opposite direction from the travel of the belt at the rate of, say, 200 ft. per min. The result is a windrow of ore spilled over the length of the bed with surprising uniformity.

From the time the ore leaves the sampling works this bedding process takes little or no manual supervision, though it is thought safer to have a man or two, track walkers as it were, watch the various transfers from belt to belt.

The bed thus formed is triangular in cross-section with a base 35 or 40 ft. across and a peak or altitude about 16 ft. high; each linear foot holds about 23 tons. The two large beds at Copper Hill are a little over 300 ft. long and the two smaller ones about half that length.

Each Linear Foot of Bed Identical

The important fact about a bed thus formed is that each linear foot of the pile is identical, both chemically and physically, with every other linear foot; it makes no difference in what order the various materials are put on. Three thousand tons of fines could be bedded first and then covered with 4000 tons of coarse, still each longitudinal foot would have its proper proportion of fine and coarse. Similarly, if the basic ore is slow in arriving for two or three days, quartz and siliceous ore can be bedded instead of waiting for a layer of one and then a layer of the other. There is a segregation of the coarse to the outer edges and the fines to the center, but this makes no difference whatever, for this segregation is uniform throughout the length of the bed and the reclaiming machine takes a perfect slice or section across the face of the whole bed. The coke is preferably dropped slightly to one side of the peak (the side next the reclaiming belt), so as to subject it to the least possible travel, conveying or handling, and thus avoid breakage.

The reclaiming machines, one of which is now always in reserve and on a reserve bed, travel on a track of about 60-ft. gage, each rail of which is laid along the outer edge or side of a bed so that the machine spans the entire width. It moves forward from end to end of the bed with an almost imperceptible motion, perhaps ½ in. per min. (this would be 2½ ft. per hour, or say 60 tons per hour, or 1440 tons per day). The power is transmitted through a trolley wire carried on the superstructure. The machine carries suspended in front of it a great triangular harrow, approximately the size and shape of the bed section and supported in a forward leaning position against the face of the bed at about the angle of repose. This harrow is the first thing to touch the ore in reclaiming. It moves from side to side with a motion of possibly six inches, imparted to it through a connecting rod and crank disk and pin from a long motor-driven shaft (all motors being carried on the reclaiming machine itself). The teeth of this harrow thus scrape gently the face of the bed, causing the material to trickle down to the foot or toe uniformly over the whole cross-section. Here it lands on an apron of sheet steel carried by the machine at ground level, on which it is continually conveyed laterally across the foot or toe of the bed on this steel apron, by a plow conveyor, also a part of the reclaiming machine.

These plows push the ever-accumulating material across and off the side of the bed onto a belt conveyor, which runs in a shallow trench alongside the entire length of the bed, whence it transfers to other conveyors until it finds its way to the feed-floor charge pockets. From these pockets it is ready to be charged into the furnaces without any further addition of material, and even without weighing, the accurate measurement of the distance traveled by the reclaiming machine into a bed giving an accurate weight of the material reclaimed during any given period. The bedding is done on day shift only and takes, say 10 or 12 men, including the sampling. Reclaiming is done intermittently during the 24 hours and this takes nominally a machine runner, three belt tenders, and a roustabout or two on each shift. The power consumption is small. Belt renewals have been found to approximate $5000 per year and the repairs other than belt renewals, now that the plant is thoroughly broken in, are small. Accurate figures are not at hand at the

moment, for these various items, but it can readily be seen that where the total daily cost is divided by a reasonably large tonnage handled, the per ton cost must be small.

In deciding on this installation, however, it was estimated that the actual cost of getting materials to the blast furnaces in this way, might be somewhat greater than by the old method. Economies looked for, were therefore economies in a more excellent metallurgy purely and simply. These metallurgical economies, it is a pleasure to state, have been, and are being fully realized. At first the mere centering of the conveyors on idlers seemed to be a tremendous task and one that required a large force of men. Now one man attends to this matter and kindred details with the utmost ease. Pulleys and gears had to be reset, at first the sampling mill gave much trouble, several wrecks were inevitable incidents in the operations of the reclaiming machine. Plows broke and all manner of trouble was encountered during many months, all of which mechanical troubles have disappeared entirely. There is, however, one condition that must be carefully looked to at all times, viz., not to let the ore supply run short; or to put it in another way, not to clean up the beds because if this is done, as has occurred two or three times at Copper Hill, it means that the mines must supply during a given time at least 8000 or 9000 tons of ore more than the furnaces can or do use, in order to accumulate a bed and a little start on a second bed. If memory serves, this entire expensive bedding plant was idle for seven or eight months, because the beds were empty and the mines could never get ahead of the smelter in the matter of ore supply. About May 1, however, came the annual shutdown of the furnaces and acid plant for repairs. During this shutdown the mines ran and the beds were filled and have been kept running regularly ever since, thus the past couple of months afford a comparison between smelting and acid-making conditions, while running exclusively from the beds as against running in the old way from the bins where analyses are unknown and weights approximate.

To record these differences very briefly: First, the matter of coke, 4½ to 5½% of coke to the charge on the green-ore furnaces is normal when running from the bins. The past two months have resulted in a saving of coke to such an extent that now from 2.8 to 3.2 is normal.

In the matter of tonnage or furnace duty, the average tonnage of charge per furnace day is now approximately 580 (using a month's average), while with the more irregular conditions which obtained, when running on unbedded ore between 80 to 90% of this figure would be normal.

Of all the advantages derived from this system, however, by far the greatest is the uniformity of the gas. This is very striking. For convenience sake, the gas analyses which are taken at various points, half hourly and in some cases every 10 min., are averaged during four six-hour periods of a day. Averaging analyses over six-hour periods oftentimes, however, conceals fluctuations from hour to hour, nevertheless a comparison of the six-hour averages during the last last 60 days, when beds have been operating without interruption, with similar six-hour periods while the bedding plant was not in operation, show an improvement in the gas conditions which has resulted in a wonderfully increased outout of sulphuric acid and in a saving in costs.

Formerly it has sometimes been the case when the output of the mines happened to be uniform from day to day, that the gas from the blast furnaces was also fairly uniform, never going below 5½% of SO_2 or over 6½% of SO_2 for periods of a week or more; then, however, would nearly always follow a period of ungovernable fluctuations from 3% up to 7%. An effort was always made to meet such fluctuations with special charges on the blast furnaces to tone up the gas. Sometimes good gas would result from this treatment for a shift or a day, but rarely permanently. Many periods have been encountered when ore came from certain stopes in the mines, which was of unfavorable analysis when nothing could be done to improve the gas over a 3½% SO_2 content, for instance. It was simply necessary to wait until the ore improved.

For the past couple of months, taking the ore good and bad just as it has come from the mines and making uniform beds of it, the gas has rarely for an hour or two at a time been below 6% of SO_2 and rarely over 6.8% of SO_2. These conditions are almost perfect and are a direct result of the uniform mixture now fed to the blast furnaces from the beds. It is possible that two months is not quite a long enough period from which to draw final conclusions. But the summer months, in a damp climate like that of Copper Hill, have always been hardest on furnace running and gas conditions, and yet it is during May and June that these striking improvements have taken place. In all previous runs of the bedding plant, during the past 18 months, intermittent and spasmodic though they have been, the same tendency toward greater steadiness, and more uniform furnace running, even gas, and low coke, has always been very marked.

The metallurgical success attending this installation, though only reasonable to expect, is nevertheless a pleasure to record.

Ford's Multiple-Spout Ladle Runner

The use of multiple-spout ladle runners in order to pour the contents of furnaces quickly is by no means new. Ordinarily it has been the custom to regulate the streams in the separate branches by small dams of fireclay. Edward L. Ford, of Youngstown, Ohio, attempts to avoid this by arranging a double spout, which is supported by a post and a riding ring. The relative heights of the two branches can be regulated by these supports, and, of course, the relative rapidity of flow of the metal through them will be altered likewise as the ladle tilts from one side to the other. This is covered by U. S. pat. 1,061,280.

The Mica Market

Harrison Watson, Canadian Trade Commissioner, at London, England, reports to the Department of Trade and Commerce, at Ottawa, that he is in receipt of frequent applications from British and Continental mica buyers, who desire to get into touch with Canadian producers and shippers who are in a position to deal with export markets. There is plenty of business offering for shippers of this product who are prepared to adopt the systematic methods to which European buyers are accustomed. Mr. Watson has been advised by a large London firm of dealers that there is an increased demand for amber splittings 1x2-in. and 1x3-in. sizes.

Production and Use of Magnesite

California is the only one of the United States producing magnesite in commercial quantities. The 1912 output in that state was 10,512 tons of crude material, according to the U. S. Geological Survey. The consumption of California magnesite is confined to the state, as railroad freight prevents its marketing farther East in competition with foreign products. Even in California the makers of flooring, tiling, building material, artificial marble, etc., purchase their supplies of calcined magnesite from the importers at a price $15 to $25 per ton higher than that got for the native material. This is largely due to the fact that the American producers do not furnish a standard or a suitable product for these purposes. The greater part of the production mentioned for 1912 was derived from the mines of the Tulare Mining Co., in Tulare County. This product, after calcination at the mine, is shipped to the paper mill of the Willamette Pulp & Paper Co., of Oregon, where it is used as a digester in the manufacture of paper from wood pulp.

Magnesite is the normal carbonate of magnesium, $MgCO_3$, a dense, white, massive mineral rarely showing crystalline structure, or cleavage. Most of the known deposits are associated with basic intrusive igneous rock, where they occur as veins or lodes in part replacing the rock.

The uses of magnesite include: (1) Various refractory purposes, such as brick, furnace hearths, crucibles, etc.; (2) as sulphite for digesting and whitening wood-pulp paper; (3) as crude material for the manufacture of carbon dioxide; (4) in ground and calcined form, as material for oxychloride or Sorel cement; (5) miscellaneous applications in crude or calcined form; (6) miscellaneous refined salts. The refractory uses of calcined magnesite constitute perhaps its most important application. The presence of lime, silica, iron and alumina are supposed to be objectionable in magnesite thus used.

Oxychloride cement is a mixture of finely ground calcined magnesite with magnesium chloride. It is put out under many trade names, especially that of sanitary flooring. It produces a smooth, even floor, which may be laid in large areas without cracking, takes color advantageously, and is susceptible of good polish by oil or wax. It has a resilience not given by ordinary cement, and does not pulverize or grind to dust. Its extensive use in this capacity abroad is leading to an increasing adoption in this country.

Among miscellaneous applications of magnesite may be mentioned its use as a nonconducting pipe covering, as an absorbent for dynamite, as an adulterant in paint, for the prevention of scale in boilers using sulphurous waters, as a fireproof or fire retarding paint, and as a binder for briquetting coal.

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Coppee Coke Ovens at Lubumbashi, Katanga

The Union Minière du Haut-Katanga has furnished *South African Engineering* with particulars of the coke ovens it is erecting at Lubumbashi, to provide the coke required for its copper smelting. Altogether 44 coppee ovens are being erected in two sets of 22 ovens each. The type erected is for non-recovery of byproducts, the waste heat being utilized for raising steam from two 3000-sq.ft. water-tube boilers. The capacity of each oven is from five to six metric tons of coke, and the coking time is about 48 hours. The capacity of the plant when completed will be between 3000 to 3500 metric tons of coke per month. The accessory plant includes a coal-unloading device of 30 tons per hour capacity; two crushers, each of 15 tons per hour capacity; and a coal-bin of 150 tons capacity.

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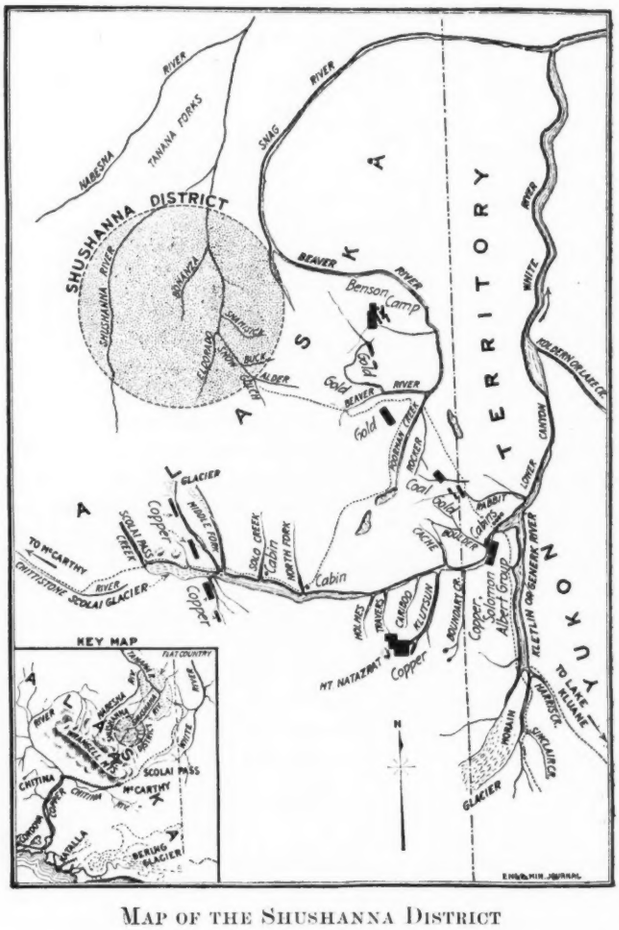
Map of the Shushanna District

The Shushanna is now attracting more attention than any other district in Alaska. Rich gravel was found last spring not far from the international boundary, and since the richness of the washings has been widely proclaimed a stampede of no small proportions has resulted.

The most enthusiastic gold seekers have already claimed the discovery of a second Klondike, but so far



MAP OF THE SHUSHANNA DISTRICT

little that is authentic is known of the district. The distance from Cordova along the line of the Copper River & Northwestern Ry. to McCarthy is 190 miles, and from McCarthy to the new diggings, through the Scolai Pass, is about 100 miles. The accompanying map shows the relation of the new district to the headwaters of the Tanana and White River. The trail from McCarthy, on the Copper River railroad, is shown on both the larger detail and the insert maps. In the JOURNAL of Aug. 16, and of Aug. 23, has been published what is now known outside of Alaska of the facts of the recent discoveries.

Origin of the Butte Chalcocite

SYNOPSIS—Most of the massive Butte chalcocite is primary. Old belief that it was secondary was based on insufficient evidence. Its occurrence at depth, its intimate association with other minerals, its failure to correspond with surface topography, its great age, its direct replacement of altered granite in depth, lack of evidence showing present deposition and positive evidence that it tends to alter to other minerals, all indicate a primary origin.

The explanation of the persistence to great depths in the Butte copper veins of the mineral chalcocite has always been an interesting problem for economic geologists. The occurrence in other districts of chalcocite of the sooty variety, which was evidently of secondary origin, and a similar occurrence in Butte, formerly led to the conclusion that all the Butte chalcocite was of secondary origin. In Butte, however, after passing through the zone of sooty chalcocite, instead of lean copper ores, rich massive chalcocite was encountered. The origin of this massive chalcocite, especially as to whether it is secondary or primary, is a matter of debate.

Causes of the Belief in Secondary Origin

The facts which have led to the belief that the chalcocite is chiefly of secondary origin are as follows (1) The chalcocite is often of a later age than the vein minerals with which it is associated; (2) in some instances, the proportionate amount of chalcocite present decreased rapidly with depth; (3) in many instances in other camps it has been proved definitely that chalcocite is a product of descending sulphate waters; (4) in many of the veins the chalcocite enrichment bears a definite relation to the depth of the zone of oxidation.

It is the opinion of the author that most of this massive chalcocite is of primary origin, that is, deposited directly from the original uprising solutions. Probably some of the massive chalcocite is of secondary origin, and there is an overlapping of primary and secondary chalcocite in the veins, inasmuch as primary chalcocite is believed to have originally extended to an elevation higher than the present ground surface. Thus suffering the effects of surface alterations, it was made to enrich itself, as it were.

Evidence for a Primary Origin

The facts supporting the belief that primary chalcocite exists in large quantities in the Butte veins are as follows: (1) Its occurrence in great abundance at points 3000 ft. below the surface; (2) its intimate association with bornite, pyrite, and enargite in such a manner that all must be considered to have been deposited at one time; (3) the lack of relation between its occurrence and the surface topography; (4) its presence in dry veins, and in deep levels, and in situations where it is often cut by faults, which shows that, whether primary or secondary, the mineral is old, and not related to present-day ground-water circulation; (5) the direct replacement of altered granite at deep levels, a phenomenon which cold, surface waters are probably not able to bring about; (6) lack of evidence showing its deposition at the present day except as sooty chalcocite, and positive evidence that the massive chalcocite itself tends to alter to other minerals, such as bornite and chalcopyrite, when subjected to present ground-water conditions.

Note—An excerpt from a paper by Reno H. Sales, entitled "Ore Deposits at Butte, Mont.." A. I. M. E. Bull., August, 1913.

Massive Chalcocite Older than the Rarus Fault and Steward Fissuring

The undoubted secondary chalcocite, that is, the sooty variety, is the result of downward-seeping sulphate solutions. It can be pretty well proved that the massive chalcocite existing in the deeper levels is in no way related to the present ground-water circulation, but that its formation must be referred to a relatively old period of mineralization. Thus the Rarus fault sharply cuts many of the ore veins, displacing them several hundred feet. Yet the truncated portions beneath the faults are as rich as the portions above, whereas the possibility is exceedingly remote that they could have been subjected to the influence of surface waters after the faulting in view of their position with regard to the fault. Hence it follows that the chalcocite-bearing veins in their existing form antedated the formation of the fault, especially in view of the fact that the fault itself is not mineralized. By structural relations the Rarus fault can be shown to be relatively old, so that any chalcocite deposited previous to it must have been deposited long before the present ground-water circulation was established. Similar structural relations would seem to show that chalcocite existed as a vein filling previous to the formation of the Steward fissure system. The existence in the Blue-vein fissures of great oreshoots which do not extend to the surface, and above which not only the copper minerals disappear, but the typical gangue minerals as well, is a point of importance. These minerals evidently had a common origin, and are not related in any way to subsequent crossfissuring or faulting. The intersection of these Blue-vein oreshoots, rich in chalcocite, with Steward fissures, are numerous, and from the evident lack of influence of these intersections on the mineralogical character of the ore, the conclusion must be reached that the chalcocite existed in large quantities in the Blue veins prior to the Steward faulting.

Formation of Old Chalcocite by Meteoric Waters Improbable

If the chalcocite is older than the time of the Steward fissuring, it is extremely difficult to account for its formation by the circulation of meteoric waters. For at this time it is fair to assume that the surface was much higher than at present, needing therefore an extremely deep ground-water circulation to reach the orebodies of the Blue vein which are even now 3000 ft. from the surface. The time required for this process would be enormous, and under the conditions governing the present deposition of chalcocite, almost all the copper is taken from the surface-water solutions before a depth of 1200 ft. below the zone of oxidation is reached. Furthermore, during the time of formation of the Steward fissures, the original solutions were still rising, and it is evident that descending meteoric waters could not make head against this rising circulation. It is a reasonable assump-

tion that no important downward movement of meteoric waters took place until the rising solutions ceased. There is no question but that the solutions continued to rise during the period of the formation of the Steward veins, since the typical primary minerals are found therein. Meteoric waters, therefore, could hardly have deposited deep-seated chalcocite until well after the close of the Steward period.

No Relation Between Massive Chalcocite and Oxidized Zones

The deep, massive chalcocite bears no relation to the present surface topography, whereas the undoubtedly secondary sooty chalcocite does. Thus the tops of many rich bodies of the massive variety occur at depths varying from 100 to 1500 ft. from the surface, and the size to the orebody is in no way indicated by the depth of the zone of oxidation; in fact, many of the larger shoots are capped by several hundred feet of barren crushed granite, on top of which the oxidized zone is less than 25 ft. in vertical extent. In the quartz-pyrite veins in the Anaconda system, on the other hand, where the development of sooty chalcocite is greatest, there is apparently a close relation between the depth of oxidation and the quantity of mineral existing below. If a secondary origin is assumed for the massive orebodies capped by several hundred feet of barren crushed granite, the question as to the source of the copper entering into these orebodies is of vital interest. It does not seem possible that the source of the chalcocite could have been at a higher point, for there is no evidence of the existence or passage of copper-bearing minerals above the deposit.

In the Shannon vein of the West Colusa mine, which belongs to the Anaconda-vein system, orebodies of enormous size in the upper levels became impoverished in depth, although the vein itself continued strong and big. Other examples might be mentioned, where the old quartz-pyrite veins were broken by later faults and all conditions seemed ideal for the formation of chalcocite ores in depth, but none took place other than the sooty glance enrichment. In the Mountain Chief oreshoot of the Jessie vein, belonging to the Blue system, there is a complete transitional change from chalcopyrite ore to an ore containing chalcocite within 50 to 75 ft. It is impossible to conceive of a surface-water origin for this chalcocite underneath a chalcopyrite capping.

In most of the quartz-pyrite veins of the Anaconda system, it must be admitted, an important zone of secondary enrichment occurs, in which the massive chalcocite is found, and it is perhaps reasonable to suppose that the chalcocite below this, in which the sooty variety does not occur, also is secondary, the whole shoot having had a common origin. The early prominence of veins of this class was probably largely responsible for the former general belief in the secondary origin of the chalcocite of the Butte vein.

Presence of Kaolin at Depth Not Conclusive Evidence

The sooty chalcocite is the result of the action of sulphate waters on pyrite. These sulphate waters also form kaolin from the granite. These downward seeping waters must become weak and inactive at any great depth below the surface, as can be seen by the relative intensity of their action on both veins and granite at surface and at depth. Apparently, the formation of the massive chalcocite on the lower levels would require much more vigorous chemical processes than the formation of the sooty chalcocite in the upper levels. After passing the chalcocite zone, therefore, the sulphate waters would not be capable of forming the massive variety, especially in view of the fact that most of the copper would have been deposited in the upper zone. The presence of the sulphate waters in depth, as shown by the formation of kaolin, does not necessarily mean that chalcocite could have been formed by the same waters, although they are responsible for its formation in the upper levels. It is impossible to conceive their retaining copper in appreciable quantities under the conditions existing. The work of Charles T. Kirk, showing the relation between the sulphate waters, the chalcocite and the kaolin, while of great value, is not to be taken as conclusive, because his samples were collected from the Pittsmont vein, which is not typical.

Weed Attributes Enrichment to Subsequent Faulting

W. H. Weed states that the old quartz-pyrite veins were originally of low grade, and were made commercially valuable through the later addition of enargite, bornite, chalcocite, and other copper minerals. He believes that this mineralization and enrichment followed various periods of faulting, the enargite and bornite being first to appear, probably contemporaneous in a general way with the time of the formation of the Blue and Steward systems. Chalcocite he states to have been almost entirely a product of descending enrichment processes, which acted at a great depth only where the older quartz-pyrite veins were cracked and broken by subsequent faults, thus permitting the entrance of the surface waters. He cites examples of the intersections of faults and older veins, and maintains that the quartz-pyrite veins are workable only where they are fractured.

Weed's Conclusions Not Borne Out by Facts

The observations of the author do not confirm these conclusions. Examination shows that in general the Anaconda veins are no richer at or near intersections with the Blue veins, which are faults, than at other points along the strike, unless the faulting Blue vein happens to cross the original oreshoots of the older veins. It is extremely difficult to form even an approximate idea of the extent of primary enrichment in the older veins, due to the late faults of the Steward system. Mineralization went on in the early veins after the formation of the Blue vein, as well as before, so that the influence of the subsequent faulting is indeterminable. As might be expected, the fault vein intersections are usually accompanied by a breaking or shattering of both the older vein and the country rock in the immediate vicinity, this developing favorable conditions for ore deposition at such points. In any case where chalcocite enrichment of a vein of the Anaconda system is shown to have resulted from the influence of an intersecting fissure of the Blue or Steward systems, there remains a strong probability that such enrichment is due to primary waters, if, as believed, the primary chalcocite was deposited in great quantities after the appearance of these faults, not only within the faults themselves, but in the fractured older veins.

Calculation of Extraction in Cyanidation

By Herbert A. Megraw

SYNOPSIS—A discussion of points previously brought out as to the means and methods of sampling and calculating extractions. Those methods based on definite sampling are believed to be most satisfactory and worth all they cost.

However strenuously it may be denied, there is nevertheless a straight course of reasoning leading to the conclusion that complete sampling of heads, tailings, and intermediate stages in cyanide treatment of ore is possible, practicable and of economic value. Information derived from these definite facts is likely to be of greater value than approximations, flattering though the latter may be.

After having devised a thoroughly accommodating system which gave satisfactory results regardless of all changes, the operating metallurgist is hardly to be blamed for objecting to having it taken away from him. The fact that it does not show the truth, however, justifies opposition to it. In the article on "Silver Cyanidation at Tonopah—III,"[1] I called attention to this method which is now so often used in many modern and efficient plants. I expressed the hope that the subject might receive general discussion in order that some definite knowledge of the true merits of the system might be obtained. That request did start discussion which, while not as generally argued as might have been desired, has still recorded some opinions on each side of the question.

Difficulty of Assaying Head Samples

The argument of A. G. Cadogan[2] is that "When treating a gold ore it is possible, due to the slight mixing the samples receive in crushing from 1¼ in. to the size that will pass a 60-mesh screen, for a particle of gold the size of the screen opening to pass in excess into the final assay sample or to be retarded and thrown away with the discard, causing an appreciable error in either case." Calculating the size of screen openings and the value of the largest piece of gold which could pass it, Mr. Cadogan finds that a difference of 26% in either direction may result when handling $10 ore. On tailing samples, he believes the opportunity of error to be very much less on account of the extreme fineness of the product and the amount of mixing it has received in passing through the mill.

If the argument advanced by Mr. Cadogan is sound, it would be interesting to know why the same reasoning would not apply to ores of much higher grade than he mentions which are satisfactorily sold by producers and bought by reduction plants. Such plants are operated by intelligent, experienced and generally honest men and are conducted on business and scientific principles. It is hard to believe that either buyer or seller would allow himself to be imposed upon continuously and certainly an enormous quantity of ore changes hands each year. That these settlements are influenced by chance, or are erratic, is beyond belief. It seems to me that Mr. Cadogan's views are not generally applicable. Few ores of milling grade have coarse gold in sufficient quantity to vitiate the general run of assay results and the one or two assays which may be affected in an extraordinary way ought to be easily detected. Moreover, consideration must be given to the mines, undoubtedly constituting the majority, which furnish their reduction plants with ores in which the value is not in coarse metallic form. These may be sampled as easily and accurately as the gangue itself.

Sampling Mortar Discharge Not Satisfactory

With ores of the latter class, it makes little difference what screen is used on the stamp battery, or other primary reducing machine, because the sample usually is, and always ought to be, taken before that machine has performed its work. Sampling mortar-discharge pulp is not satisfactory even when water is used in crushing, and when solution is used it is futile. Unless special arrangements are made to collect the mortar-discharge pulp into one solid stream, a correct sample of it cannot be taken. The head sample ought to be taken before the ore has entered the primary crushers, but after preliminary breaking, so that there will be no large boulders to interfere with the accurate cutting out of a portion of the stream. Having the material in this appropriate form, a fair sample can be taken without regard to the size of contained metallic particles. In the cutting down of this sample every care can be taken to avoid difficulties with metallics, but when these do appear, every assayer knows how to deal with them.

In considering the sampling of the product from stamp mills, George Simpson, Jr.,[3] expresses the opinion that a fair sample of the mill head can be obtained from the pulp leaving the mortar boxes, but this I cannot altogether agree with, as has already been mentioned. Experience with trying to get a fair sample from mortars has discouraged such attempts even when water is used in crushing. A good sample cannot be taken from the lip of the mortar because the pulp is too widely spread and a cut of the entire stream cannot be had at one time, a prime requisite for a fair sample. In mills making use of plate amalgamation, the stream before beneficiation is not gathered into a compact body which can be sampled with any reasonable degree of accuracy. In other cases where water is used in the batteries and there is facility for gathering the whole stream from all batteries into one body, a sample may be taken with some claim to accuracy, exactly how much depending on the character of the ore and the sampling device. It is true that most of the mechanical sampling appliances in use are not accurate because only a portion of the stream is taken at any one time, the cutter or entry slot of the sampler often being excessively narrow. In sampling a stream of pulp, as well as with a stream of dry ore, the requirement is that the sample must take the whole stream for part of the time, and not a part of the stream part or all of the time. It would be comparatively sim-

[1] "Eng. and Min. Journ.," Mar. 8, 1913.

[2] "Eng. and Min. Journ.," May 31, 1912.

Note—This is the first of a new series of articles by Mr. Megraw, which will deal with comparative details of cyanide practice. The next will be "Ores Amenable to Cyanidation," and will appear in the issue of Oct. 4, 1912.

[3] "Eng. and Min. Journ.," June 21, 1913.

ple to make a machine to comply with all the requirements but it is seldom done. Satisfactory accuracy is not obtainable over long periods of time by hand sampling. The average employee of the class usually available for such work does not have the necessary interest and cannot be depended upon to carry it out intelligently.

Solution Crushing Prevents Mortar Sampling

When solution is used for crushing, the amount of metal dissolved during the crushing period and the amount introduced with the formerly-used solution, presents an obstacle to accurate sampling that I have found unsurmountable. The argument of Mr. Simpson that the erratic extraction results appearing from month to month will be equalized and corrected in the yearly summary, is correct in instances when samples are correctly taken, but it is doubtful if a mortar-discharge sample would ever show correct results, especially when solution is used for crushing Much complication might result from the attempt to assay a pregnant cyanide solution entering the mortars, determine its proportion to the dry ore crushed, assay both the pulp and solution issuing from the mortars, and calculate the correct content of the dry ore treated. Opportunities for error are so many that it seems most unwise to make an attempt which will almost surely result in error.

Tailing Said To Be Not Susceptible of Satisfactory Sampling

Having given consideration to Mr. Cadogan's argument that the head sample is not to be had accurately, one is confused by the argument of W. S. Welton,[4] who shows that by reason of loss of floating material containing value, a tailing assay is not to be depended upon. Mr. Welton's argument is likely to prove groundless, however, where no overflow is discharged, such as is the case in any cyanide plant using solution for crushing. Whatever may be the condition in concentration plants or other mills where the entire product is not beneficiated, loss by overflow does not occur in the modern cyanide plant. When separate treatment is followed, sand is settled and the whole slime is treated, the residue is usually subjected to filtration before being discharged. It is the same in the total-sliming plant, the only liquid waste being in each case the precipitated and exhausted solution resulting from accumulation. However fine any portion of the ore may be, it is not likely to escape without being subjected to treatment. The very fact that the solids are collected in a compact body necessitates avoidance of the objection urged by Mr. Welton.

Formula for Extraction Percentages without Ore Weights

For estimation of percentage extractions it is necessary to know the weight of the ore and the content of both feed and tailing. Under some circumstances, the weight of ore milled may be omitted but in those cases the content of feed, tailing and product must be known with accuracy. Having this information, the formula quoted by Mr. Welton,

$$\textit{Per cent. extraction} = \frac{A - B}{C - B} \times \frac{100\,C}{A}$$

where A is the assay of the feed; B, that of the tailing, and C, that of the concentrate or product, is applicable and can be used with advantage.

It is not improbable that this formula might be applied with good effect in such cases where weights of ore handed are not to be easily secured. By no means should it be forgotten, though, that in making such calculations the content, or assay value of all the factors used must be accurate if correct results are expected. Sampling of the head, tailing and product must be as nearly exact as it is possible to make it.

Many Ways of Sampling and Weighing

Consideration of the possible ways of sampling coarse ore, such as is usually fed into mills, brings us rather forcibly to the conclusion that it can be sampled. It is being done every day in numberless cases, such as smelting plants, custom mills, ore-buying and sampling plants. However true it may be that particular ores carrying coarse, metallic particles present some difficulty in sampling, it is nevertheless a fact that most milling ores may be satisfactorily sampled provided sufficient care accompanies the operation of proved mechanical devices. Tailing should be as easy to sample as feed, if not more so, particularly in plants where the whole is treated as one product, such as sand-leaching plants or slime-agitation mills. When the latter operate continuously and discharge a dewatered or partly dried material, sampling is reduced to the simplest possible operation; taking a representative cut from finely-ground, thoroughly-mixed material. Sampling does not present so much difficulty as proper weighing of ore milled, and even this latter is more a difficulty of expense than anything else.

There are automatic weighing devices which will return accurately the weight of material passed over them and moisture may readily be estimated in the sample taken. In view of the ease of weighing the ore, it is remarkable that guesswork is usually resorted to and accuracy disregarded. Probably not one-tenth of the mills operating in this country are equipped with satisfactory weighing devices. Most statements of ore weight are based upon estimates; weighing a car or two every week or so and counting the number of cars emptied into the mill bin, or some similar process; methods which may easily be remote from the true weight. If such methods are to be the basis for percentage calculations, it is clear that refinements in other directions are futile. To know the truth, all the factors must be exact.

Percentage Calculations Made by Many Methods

All possible precautions as to weighing and sampling having been taken, there is still room for some difference of opinion about the method of calculating extractions. When simple, continuous processes are followed, this difficulty does not arise. Thus in concentration, amalgamation, and in a great measure the process of continuous silme agitation, the ore is not retained in process of treatment for great lengths of time and, only one treatment being given, tailing samples taken on a certain day will approximately correspond with head samples taken the same day. Calculated extraction percentages over monthly periods, in such cases, may be considered reason-

[4] "Eng. and Min. Journ.," July 12, 1913.

ably accurate. Dealing with combination processes, however, the solution is not so easy. Consider, for example, the system followed by so many mills treating silver-bearing ore, where concentration followed by separate sand and slime treatment is practiced. Concentration is quickly completed, the head, tailing and production checking up each day. Then follows slime treatment, the feed of which is part of the tailing from the concentrators. Three to 10 days are occupied in carrying out the details of the process, consequently the daily percentage calculations cannot be correct and even over a month they are likely to be erratic. When, however, one considers the sand treatment, lasting from 10 to 40 days, it will be readily comprehended that over a monthly period extraction percentages must be calculated by some other method than the simple use of mill-feed and tailing assays, which cannot have any definite relation to each other. There are, however, methods which may be applied under such circumstances which will give an idea, and a close one, of what is actually going on in such a plant. Such estimates are usually required in monthly reports, but their most important use is to the metallurgist in charge of operations. He must know what he is doing at all times so that he may be ready to correct any error or change his treatment to suit a changing ore. This situation has already been discussed,[5] and a proposed solution is to use the mill feed as 100% and the feed to the cyanide plant as a different head. If concentration extracts 20%, then 80% goes to the cyanide plant. If the latter extracts 80% of what it receives, it amounts to 64% of the mill feed, and 64% plus the 20% extracted by cyanidation gives 84% as total extraction.

Percentage Extracted in Combination Processes without Weights

Dividing the concentrate tailing into the proper portions treated as sand and slime, the extraction of each can be figured and its relation to the mill feed readily determined. Should it be required to estimate the percentage extraction in such a combination process, a formula may be derived, similar to the one previously mentioned, by the use of which the percentage extraction may be ascertained without the necessity of weighing anything and provided only that certain assays be accurately obtained. In a process using concentration and separate treatment of sand and slime, the following formula for percentage extraction will be found of use:

Let X = Per cent. extraction;
A = Assay of feed, and a, its weight;
B = Assay of concentrate tailing, and b, its weight;
C = Assay of concentrate, and c, its weight;
D = Assay of sand head, and d, its weight;
E = Assay of slime head, and e, its weight;
D_t = Assay of sand tailing, and d, its weight;
E_t = Assay of slime tailing, and e, its weight.

Then:

$$a = b + c;$$
$$b = d + e;$$
$$Aa = Bb + Cc;$$
$$Bb = Dd + Ee.$$

$$\frac{X}{100} = \frac{Cc + d\,(D - D_t) + e\,(E - E_t)}{Aa}$$

eliminating all the weight factors from this equation and substituting their equivalents, the following formula is derived:

$$\frac{X}{100} = \frac{C\frac{(A-B)}{(C-B)} + \frac{(B-E)(C-A)}{(D-E)(C-B)}(D-D_t) + \frac{(C-A)(B-D)}{(C-B)(E-D)}(E-E_t)}{A}$$

It is of interest to note that this formula can be broken up into three units, each representing a percentage extraction in one section of the process. Thus:

$$\frac{X_1}{100} = \frac{C\,\frac{(A-B)}{(C-B)}}{A}$$

gives percentage in concentration,

$$\frac{X_2}{100} = \frac{\frac{(B-E)(C-A)}{(D-E)(C-B)}(D-D_t)}{A}$$

gives percentage in sand treatment, and,

$$\frac{X_3}{100} = \frac{\frac{(C-A)(B-D)}{(C-B)(E-D)}(E-E_t)}{A}$$

gives the percentage extraction in slime treatment, the sum of percentages being the total extraction percentage. In view of the comparative ease of obtaining these assays with accuracy, it should not be difficult to approximate a percentage extraction over short periods of time, and over operations of a year or more percentages derived in this way ought to be a great deal more accurate than those obtained by the product-plus-tailing-equal-to-head method.

That it is not possible to secure accurate samples of either feed or tailing is a theory in which I cannot place confidence. If the proper mechanical appliances are installed to take samples in the right way, and these mechanical means receive vigilant supervision from persons conversant with their objects and requirements, a good and accurate sample may be obtained. Believing that it can be done and knowing that many operators do not do it, it is natural to wonder why. There are plenty of examples of mills which installed sampling and weighing apparatus and then discontinued their use. The sampling plant of the Goldfield Consolidated mill was not rebuilt after having been destroyed by fire, and it is to be supposed that the operators did not consider it essential.

Does Correct Sampling Pay?

The question, then, is not "can it be done?" but, "does it pay?" I believe that the question of cost of installation and operation and the problematic return upon it is what has resulted in the present practice. It is hard to convince operators that it is worth while to spend real money to find out the true extraction, when a much higher and better looking one can be obtained at no cost and with little labor.

Is it then, worth while to spend large amounts of money for sampling plants and their operation, or shall operators continue to use the "graphite and cellulose method," at much less cost?

I believe that actual sampling and correct extraction calculations pay—in real money. I believe that the losses accompanying the other method are more costly than proper sampling would be. By the calculation method, losses inside the mill cannot be determined. Stealing may occur without detection. Leaks may be in the tanks and pregnant solution may be lost without suspicion.

[5] "Eng. and Min. Journ.," Apr. 2, 1910.

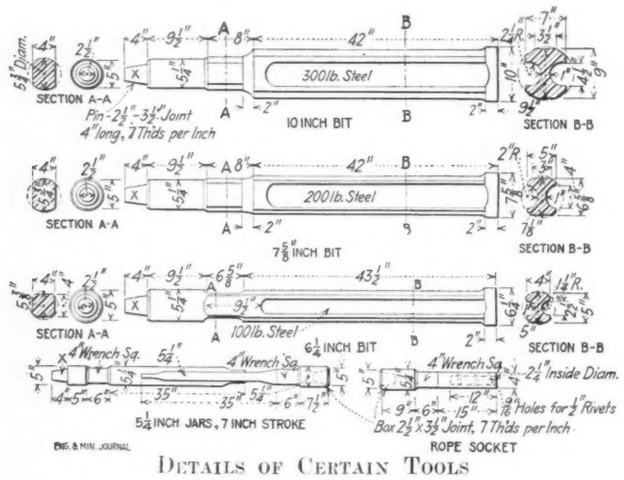
Precipitate may fall on the floor and be rubbed into it, or may be washed away, and no intimation of such loss will come through the figures. Careless operators may let tanks run over and waste the solution; it will never show and no one will know of it except those who actually see it. It puts a premium on carelessness. Whenever a calculation can be used in all kinds of cases and always check up correctly, even with bad work, there is something serious the matter with it. Beside these facts, I do not believe that correct percentages are obtained by the calculation method even where serious direct losses do not occur. I believe that extractions of silver from sulphide and other complex ores rarely run high in the nineties, and that the average extraction would be much nearer to 80 to 85%. That accurate sampling and calculation of extractions, recognition of losses and earnest endeavors to avoid them and strong efforts actually to raise extractions to the point now said to have been reached, would be a wise and economical course to pursue, I fully believe. I realize that there may be other views, however, and hope they may be presented for discussion.

❖

Itemized Equipment for Churn Drill

By H. P. Bowen*

Churn-drill practice varies according to a number of conditions: The character of the rock to be drilled; depth of holes; the purpose for which the holes are drilled; etc. The machine that does the most satisfactory work in hard rock and stands up under the bad roads



Details of Certain Tools

and high grades of a mountainous section, may show up poorly against another machine when drilling through softer formations. Tools and other equipment vary likewise.

Following is a list of equipment that was found most satisfactory under the conditions encountered at the Miami property, in Arizona, where most of the holes have been put down in a silicified schist to an average depth of 600 ft. The ground stands well until water is encountered at about 400 ft., when it is usually necessary to case. The repair parts listed are those that may give out suddenly without previously showing sufficient evidence of wear to enable their replacement from a distance. Under most conditions, 8¼-in. casing will be small

*Miami Copper Co., Miami, Ariz.

FROM STAR DRILLING MACHINE CO., F. O. B. AKRON, OHIO

1	No. 23 traction machine with No. 24 boiler, derrick and crown pulley (boiler with asbestos jacket)	$2010.00
1	Temper screw with pulley and ball bearings; screw to be 1¾x5 in; swivel to be opered so rings can be changed	35.00
1	No. 3 Star blower with forge connections	13.50
1	Crane and carriage to handle bits; arranged to fasten to derrick	35.00
1	No. 2 Barret floor jack and circle iron	46.50
2	No. 4 Barret lever jacks	36.00
2	2x14-in. screw jacks	5.50
2	50-ton hydraulic jacks; forged steel; broad base	260.00
1	Rope clamp with handle to turn tools	1.50
1	Flue cleaner	1.15
1	Funnel for filling boiler	1.50
1	Set of belt clamps	0.60
1	Belt punch	0.40
30½	ft. five-ply 12-in. belt	23.18
	Repair parts—	
1	No. 593 guide pulley block	6.50
1	No. 595 guide pulley wrist pin	4.50
1	No. 603 pipe drum for bull wheel with three cast supports	17.00
1	No. 604 gear bull wheel	18.00
1	No. 605 wood brake wheel for gear wheel	10.50
1	No. 641 pinion for friction shaft for yoke	5.50
1	No. 644 yoke for friction shaft pinion	1.75
1	No. 653 sand reel eccentric	4.50
2	No. 667 sand reel flanges with drum	9.00
1	No. 683 wrist pin for upright arm	4.50
1	No. 684 deep groove pulley	11.00
1	No. 692 wrist pin for slide arm	4.50
1	No. 710 band wheel shaft	13.00
1	No. 711 band wheel	37.00
1	No. 712 band wheel key	1.10
1	No. 722 crank arm for band wheel shaft	10.00
2	No. 723 wrist pins for crank arm	9.50
1	No. 739 walking beam saddle	4.75
1	No. 757 crown pulley for No. 24 derrick	11.00
	Total	$2653.43

OIL WELL SUPPLY CO., F.O.B. LOS ANGELES, CALIF.

1	Henderson trip casing spear to catch 8¼-in. casing	$137.00
1	Henderson trip casing spear to catch 6¼-in. casing	112.00
	Total	$249.00

TUBBS CORDAGE CO., F.O.B. SAN FRANCISCO, CALIF.

	1000 ft. of 2-in. Philadelphia right-laid line drilling cable	$188.16

LESCHEN & SONS ROPE CO., CHICAGO, DENVER AND ST. LOUIS

	1000 ft. of ¾-in. patent flattened strand drilling cable	$122.00
	1000 ft. of ⅝-in. or 7/16-in. sand line	18.50
	Total	$140.50

UNION TOOL CO., LOS ANGELES, CALIF.

2	Connections for 2-in. rope to ¾-in. cable	$10.00
2	Extra connections for 2-in. rope	10.00
	Total	$20.00

LARKIN & CO., F.O.B. BUTLER, PENN., WEIGHT 16,000 LB. 2% DISCOUNT FOR 30 DAYS

2	3½-7 rope sockets	$22.00
1	3½-7 rope sockets, 5-in. box	11.00
2	4½-in. o.d. by 20 ft. stem 3½-7 jt., 5¼-in. o.d. box	91.94
1	4½-in. o.d. by 20 ft. stem 3½-7 jt., 5-in. o.d. box	45.97
2	Sets 5½-in. o.d. by 7-in. stroke jars 3½-7 jt.	105.00
1	Set 5½-in. o.d. by 7 in. stroke jars 3½-7 jt.	52.50
4	10-in. bits 300-lb. steel 3½-7 jt.	230.00
6	7⅝-in. bits 200 lb. 3½-7 jt.	222.00
4	6¼-in. bits 120 lb. 3½-7 jt.	104.00
1	4½-in. o.d. by 8 ft. sinker 3½-7 jt.	28.00
1	Set 5½-in. o.d. by 24-in. stroke jars 3½-7 jt.	60.00
1	7⅝-in. hole slip socket with bole for 10-in. hole with 3½ jt.; two sets of slips steel-lined, one set of medium and one set of heavy	92.00
1	6¼-in. hole slip socket with two sets of slips; one set of medium and one set of heavy 3½-7 jt.	60.00
1	10-in. hole horn socket 3½-7 jt.	36.00
1	7⅝-in. hole horn socket 3½-7 jt.	29.00
1	6¼-in. hole horn socket 3½-7 jt.	21.00
1	6¼-in. hole center rope spear with rings for 7⅝-in. and 10-in. hole 3½-7 jt.	34.00
1	Horseshoe trip rope knife outfit complete, which includes one swivel top, one set of pipe jars, two sinkers and one knife	29.00
1	6¼-in. hole jar bumper with ball bearing swivel top and concaved on back like a spud., front and back	27.00
1	6¼-in. hole latch jack, 3½-7 jt.	16.00
2	7-in. o.d. by 12 ft. wrought iron bailers	38.00
2	5-in. o.d. by 14 ft. wrought iron bailers	28.00
2	4-in. o.d. by 16 ft. wrought iron bailers	20.00
1	Pulling ring for 8¼-in. casing with one set of slips for pulling 8¼-in. casing and one set of slips for pulling 6¼-in. casing	90.00
1	Pair 4-in. square tool wrenches, 175 lb. each	28.00
1	Set of 8¼-in. Fairs patent wrought-iron elevators	42.70
1	Set of 6¼-in. Fairs patent wrought-iron elevators	35.00
1	10-in. bit gage	1.25
1	7⅝-in. gage	1.00
1	6¼-in. gage	0.85
1	6¼-in. hole spud, by 10 ft. in clear 3½-7 jt.	45.00
1	7⅝-in. hole spud, by 10 ft. in clear 3½-7 jt.	50.00
1	7⅝-in. wall hook 3½-7 jt.	33.00
1	6¼-in. wall hook 3½-7 jt.	29.00
1	Set of 4-in. square drive clamps with wrench	32.30
	Total	$1790.51

enough for a 10-in. hole, but if necessary, the 10-in. bit can be spread ½ in. When casing must be driven, it will pay to use 6⅛-in. drive pipe, but otherwise the extra weight and cost will prove a detriment.

In making the list, it has been taken for granted that the drill will be at work at least part of the time at some distance from shops and supplies, and, therefore, tools and supplies for all ordinary repairs have been included. In the matter of lubricating and lighting oils, coal and coke, pipe and fittings for the water supply, tools and supplies for road building, amounts have been omitted, as they depend entirely upon the conditions under which each special job of drilling is to be done.

Prices given on small tools are f.o.b. Miami, except in the case of estimated prices, which are f.o.b. St. Louis.

CASING BOUGHT IN PITTSBURGH AND DELIVERED TO BUTLER, PA., TO SHIP IN SAME CAR WITH LARKIN & CO. TOOLS.

600 ft. of 8¼-in. steel casing, 11½ threads, 20-lb. @ 63c	$378.00
800 ft. of 6¼-in. steel casing, 11½ threads, 13-lb. @ 36¾c	294.00
5 ft. of 11⅝-in. casing, for conductors, no threads, estimated 10 ft. of 11⅝-in. casing, for conductors, no threads, estimated 15 ft. of 11⅝-in. casing, for conductors, no threads, estimated	35.25
2 6¼-in. casing nipples, 11½ threads	31.50
2 8¼-in. casing nipples, 11½ threads, estimated	36.00
6 6¼-in. recessed couplings, list price	8.10
8 8¼-in. recessed couplings, list price	13.50
Total	$796.35

FOR POSSIBLE USE OF DRIVE PIPE

600 ft. of 8-in. drive pipe, eight threads per in., estimated	$588.00
800 ft. of 6-in. drive pipe, eight threads per in., estimated	536.00
6 extra couplings 8-in., eight threads per in., recessed, list price	16.80
6 extra couplings 6-in., eight threads per in., recessed, list price	24.00
2 6-in. casing nipples eight threads per in., recessed, estimated	15.75
2 8-in. casing nipples eight threads per in., recessed, estimated	36.00
1 Drive head 8-in. drive pipe, list price	24.25
1 Drive head 6-in. drive pipe, list price	15.00
2 Drive shoes 8-in. drive pipe	16.00
2 Drive shoes 6-in. drive pipe	22.00
Total	$1293.80
Casing spear must be made to fit casing.	

SAMPLING SUPPLIES

1 Panning disk, estimated	$0.50
1 Sampling trough (can be made on job)	
1 Sampling cutter, light weight jute, estimated	30.00
500 Sample sacks 14x24-in. (Colo. Tent & Awning Co. Denver)	41.13
1 Funnel for sample sacks, estimated	2.00
1 Wire brush for cleaning tubs, estimated	0.50
6 24-in. or 26-in. tubs, estimated	6.00
2 Old track rails for drying samples	
Sample record sheets	
Books for samplers, estimated	1.00
500 copper tags to mark sacks	2.50
1 Set of 1⅛-in. steel numbers to stamp tags, estimated	2.70
Total	$86.33

MISCELLANEOUS

2	Gasoline torches	$2.51	1 Square	$1.09
4	Lanterns	2.60	1 15-in. jack plane, estimated	2.00
3	600-gal. water tanks, estimated	50.00	1 Claw hammer, estimated	0.40
			1 ⅛-in. wood chisel, estimated	0.35
1	Large iron pulley block for 2-in. rope, list price	19.50	1 1½-in. wood chisel, estimated	0.55
			1 10-in. screw driver, estimated	0.50
1	Double swivel hook, 2-in. rope, list price	6.00	1 12-in. brace	1.52
			1 Bit, ⅜-in.	0.22
12	¾-in. black cable clamps	2.40	1 Bit, ½-in.	0.22
6	¾-in. black cable clamps	2.13	1 Bit, ⅝-in.	0.26
2	½-in. check valves	1.30	1 Bit, ¾-in.	0.31
2	1½-in. Lunkenheimer globe valves	3.22	1 Bit, ⅞-in.	0.37
			1 Bit, 1-in.	0.43
1	Set ½-in. water gage	2.00	1 Draw knife	0.48
6	Gage glasses ⅝x12-in.	0.48	1 Combination pipe vise, ¼-in. to 2 in., estimated	2.25
1	Heavy chain tongs No. 35	11.69		9.60
1	Medium chain tongs No. 33	4.27	1 Hack saw	0.88
50 ft. of rubber garden hose ¾-in.		8.50	12 12-in. hack saw blades	0.42
25 ft. of ¾-in. suction hose for injector, list price		17.50	2 10-in. flat mill files	0.26
			2 12-in. flat mill files	0.27
2	Empty distillate tanks or barrels		2 10-in. cant. saw files	0.36
			2 8-in. triangular files	0.22
2	12x½-in. bastard files	0.52	2 12-in. flat bastard files	0.42
2	10-in. round rat-tail files	0.26	1 8-in. flat bastard files	0.45
1	Post drill to drill holes up to 1 in., estimated	9.60	Drills to fit both ratchet and post drill.	
1	Ratchet drill to drill holes up to 1 in., estimated	4.56	1 5/16-in., estimated	0.30
			1 3/8-in., estimated	0.33
1	6-in. monkey wrench	0.38	1 7/16-in., estimated	0.36
1	8-in. monkey wrench	0.42	1 1/2-in., estimated	0.39
1	10-in. monkey wrench	0.51	1 9/16-in., estimated	0.42
1	12-in. monkey wrench	0.62	1 5/8-in., estimated	0.44
1	15-in. monkey wrench	1.07	1 11/16-in., estimated	0.51
1	8-in. Stillson wrench	0.51	1 3/4-in., estimated	0.55
1	10-in. Stillson wrench	0.53	1 13/16-in., estimated	0.60
1	14-in. Stillson wrench	0.83	1 7/8-in., estimated	0.66
1	¼x¾-in. open end wrench	0.20	1 15/16-in., estimated	0.72
1	⅜x¾-in. open end wrench	0.25	1 1-in., estimated	0.78
1	½x¾-in. open end wrench	0.30	1 1 1/16-in., estimated	0.84
1	Axe	1.14		
1	Hand axe	0.69	Total	$188.64
1	Hand saw 28-in.	1.32		

BLACKSMITH OUTFIT

1	200-lb. anvil, estimated	$25.00	1 Top swage, ¾-in., estimated	0.45
1	Pair 20-in. straight lipped tongs, estimated	0.25	1 Top swage, ⅞-in., estimated	0.45
			1 Bottom swage, ¾-in., estimated	0.30
1	Pair 22-in. straight lipped tongs, estimated	0.30	1 Bottom swage, ½-in., estimated	0.30
1	Pair bolt tongs, ½-in., estimated	0.35	1 Bottom swage, ⅝-in., estimated	0.35
1	Pair bolt tongs, ⅝-in., estimated	0.40	1 Bottom swage, ¾-in., estimated	0.40
1	Pair bolt tongs, ¾-in., estimated	0.40	1 Bottom swage, ⅞-in., estimated	0.40
1	Ball peen hammer, 2-lb., estimated	0.50	1 Hot chisel, 1½-in., estimated	0.25
1	Riveting hammer, estimated	0.35	1 Hot chisel, 1½-in., estimated	0.30
1	8-lb. sledge, estimated	0.50	1 Hot chisel, 2-in., estimated	0.50
1	Pair 20-in. gad tongs, estimated	0.35	1 Wire thread brush, estimated	0.25
			1 2-in. flatter, estimated	0.30
1	Pair 24-in. gad tongs, estimated	0.40	1 3-in. flatter, estimated	0.60
			1 2-lb. set hammer, estimated	0.30
1	Pair 22-in. pick up tongs, estimated	0.50	1 3-lb. set hammer	0.45
1	Top swage, ⅜-in., estimated	0.31	1 1½-in. hardy	0.75
1	Top swage, ½-in., estimated	0.31	1 2-in. hardy	0.75
1	Top swage, ⅝-in., estimated	0.40	Total	$37.27

GENERAL SUPPLIES

20 ft. of ¾-in. pipe		$0.40	12 ½-in. plugs, estimated	0.24
80 ft. of ½-in. pipe		2.00	12 ¾-in. plugs, estimated	0.36
40 ft. of ¾-in. pipe		1.20	12 ⅞-in. unions, estimated	0.50
12	¼-in. couplings	0.18	12 ½-in. unions, estimated	0.60
12	½-in. couplings	0.24	12 ¾-in. unions, estimated	0.70
12	¾-in. couplings	0.36	12 ¼-in. nipples, estimated	0.15
12	⅛-in. ells	0.24	12 ⅛-in. ells, estimated	0.15
12	½-in. ells	0.24	12 ¼-in. to ⅜-in. bushings, estimated	0.24
12	¾-in. ells	0.36		
12	¼-in. tees	0.24	12 ⅜-in. to ½-in. bushings, estimated	0.30
12	½-in. tees	0.42		
12	¾-in. tees	0.42	12 ½-in. to ¾-in. bushings, estimated	0.36
12	¼-in. nipples, estimated	0.24		
12	⅜-in. nipples, estimated	0.24	Total	$10.92
12	½-in. nipples, estimated	0.36		
12	⅝-in. plugs, estimated	0.18		

MACHINE BOLTS

12	¾x4-in.	$0.12	12 ¾x11-in., estimated	0.60
12	¾x5-in.	0.12	12 ¾x12-in., estimated	0.60
12	¾x6-in.	0.18	12 ¼x4-in.	0.48
12	¾x7-in.	0.18	12 ¼x5-in.	0.48
12	¾x8-in.	0.24	12 ¼x6-in.	0.48
12	¾x9-in.	0.24	12 ¼x7-in.	0.60
12	¾x10-in.	0.24	12 ¼x8-in.	0.78
12	⅞x4-in.	0.18	12 ⅜x9-in.	0.90
12	⅞x5-in.	0.24	12 ⅜x10-in.	0 90
12	⅞x6-in.	0.24	12 ½x4-in.	0 66
12	⅞x7-in.	0.24	12 ½x5-in.	0.72
12	⅞x8-in.	0.36	12 ½x6-in.	0.96
12	⅞x9-in.	0.36	12 ½x7-in.	0.96
12	⅞x10-in.	0.48	12 ⅝x8-in.	0.96
12	1x11-in., estimated	0.48	25 lb. of assorted threaded square nuts ⅜-in., ½-in., ⅝-in., ¾-in. and ⅞-in., estimated	2.25
12	1x12-in., estimated	0.60		
12	¼x4-in.	0.36		
12	¼x5-in.	0.36	25 lb. of assorted cut washers	1.25
12	¼x6-in.	0.42	25 lb. of assorted bridge washers	1.25
12	¼x7-in.	0.48	25 lb. of rivets ¾-in., up to 1½-in. length, ¾-in. to ¾-in. length	1.50
12	¼x8-in.	0.54		
12	¼x9-in.	0.54		
12	¼x10-in.	0.54	Total	$22.75

SUNDRIES

100 lb. of 30d nails		$4.00	1 Bar, ⅞-in. octagon tool steel, estimated	1.50
100 lb. of 20d nails		4.00		
50 lb. of 10d nails		2.00	1 Bar, ⅞-in. octagon tool steel, estimated	1.00
50 lb. of 8d nails		2.00		
25 lb. of 6d		1.00	25 lb. of waste	2.75
25 lb. of tin roofing nails, estimated		2.50	6 Strings belt lacing	0.50
			50 lb. of babbitt metal	25.00
2 Bars, ½-in. round iron @ $2.54		0.68	1 Soldering outfit	1.00
1 Bar, ¼x1½-in. flat iron @ $3		0.77	Total	$55.20
2 Bars, 1⅛-in. octagon drill steel $5 per 100 lb., estimated		7.00		

LUMBER, ETC.

1200 ft. of 2x12-in. by 12 ft. 8 Pieces 6x6-in. by 20 ft. 10 Pieces 8x8-in. by 20 ft. 20 Pieces 2x4-in. by 20 ft. 10 Pieces 2x6-in. by 20 ft. 10 Pieces 4x4-in. by 12 ft.	3372 ft., b.m. @ $40	$134.88
60 Pieces 7 ft. galvanized corrugated iron, @ 84c. f.o.b. Miami		50.40
Total		$185.28

SUNDRIES, AMOUNTS NOT SPECIFIED

Gasoline, coal oil, engine oil, cylinder oil, cup grease, coal, coke, pipe and fitting for water supply, picks, shovels, single jacks, double jacks, powder, caps, fuse.

PIPE-FITTING OUTFIT

1	Stock	$14.51	1 Bolt die, ⅜-in.	1.27
1	Pipe die, ¼-in.	0.25	1 Bolt die, ½-in.	1.45
1	Pipe die, ⅜-in.	0.27	1 Bolt die, ¾-in.	1.80
1	Pipe die, ½-in.	0.74	1 Bolt die, 1-in.	2.15
1	Pipe die, ¾-in.	1.05	1 Coal shovel	0.63
1	Pipe die, 1-in.	1.43	2 Oil cans	0.42
1	Pipe die, 1¼-in.	1.43	1 Hoe for sample trough, estimated	0.50
1	Pipe die, 2-in.	1.43		
1	Bolt die, ¼-in.	0.67	1 Pipe cutter 1-in. to 2-in. pipe	1.50
1	Bolt die, ⅜-in.	0.80		
1	Bolt die, ½-in.	1.08	Total	$33.38

In churn drilling, as in many other things, the cost of the machine itself will be found to be only a small part of the cost of the total equipment, so that to purchase a churn drill and thoroughly equip it for work in this section of the country, will cost from $8000 to $10,000.

Developments on the Cuyuna Range

SPECIAL CORRESPONDENCE

Many thousands of dollars are being expended this season in exploratory work on the Cuyuna iron range, in Minnesota. So far as operations of this character are concerned, the Cuyuna is the most active of all the Lake Superior iron ranges. Many drills are in commission. Development work is in progress at several properties not yet on the shipping list and it is evident that next year the range will be prepared to produce a tonnage not inconsiderable for a district still in the early years of its exploitation. The Cuyuna output this season probably will approximate 1,000,000 tons. Next season the district doubtless will surpass the much older Vermilion range. The biggest shipper in 1914, it would appear from present indications, will be the Pennington mine of Tod, Stambaugh & Co. This property is being developed as an open pit and, if deemed advisable, could be put on the producing list almost any time now. The property which the Pittsburgh Steel Ore Co. is stripping at Riverton by hydraulic process also will be prepared to produce heavily next season.

It appeared formerly that the Cuyuna would be a range of underground mines exclusively. The openpit system has now been found to have advantages in various places and in several instances the overburden is to be removed where it first was believed only shaft mining was feasible. Both the Thompson mine of the Inland Steel Co. and the Armour No. 2 property of the Rogers-Brown interests are to be transformed from underground mines to openpits. The matter of concentration to raise the grade of the product also is being given attention. The installation of plants for this purpose is in contemplation at various mines. Large quantities of ore on the Cuyuna are unprofitable to ship as found in the ground but by washing much of this material doubtless will be made merchantable. A test with Cuyuna ore recently was made in a concentration works at Joplin, Missouri.

Gypsum in 1912

There was mined in 1912 in the United States 2,500,747 tons of raw gypsum, an increase of about 177,000 tons over 1911. Of this material, 441,608 short tons was sold without calcining, for use principally as land plaster and as an ingredient of portland cement and paint, according to the U. S. Geological Survey. The production was obtained in 17 states and in Alaska, the largest producer being New York, with Iowa second and Michigan third. Gypsum has a great variety of uses, such as plaster, including plaster of paris, dental plaster and Keene's cement; as a retarder for portland cement; as a land plaster or fertilizer, for which it is ground, but not burned; as an ingredient of paints, tints, crayons, paper, imitation meerschaum, ivory, etc., and as an adulterant. The pure, massive white form known as alabaster, is a material used by sculptors.

La Mazata Mine, Jalisco, Mexico

BY THOMAS C. MYERS*

Documents on file in the municipal offices of Etzatlán, and in the mining agency at Hostotopaquillo prove that La Mazata mine was an exceptionally important one and was actively worked by Spaniards during the period from 1650 to 1700 A. D. It is said to have paid a tax of more than ten million pesos to the church. This tax was supposed to be 10% of the output but was often considerably more.

The mine was abandoned after having been worked down to the level where water entered in such quantities that it could not be handled by the primitive methods in use at that time. Apparently, these conditions were reached at a depth of about 100 ft. below the neighboring valley, due probably to the fact that the now nearly extinct lake of Magdalena reached almost to the mine. In the nearby hacienda called La Estancia de Ayllones, there are at present numerous relics of mining machinery used at this old mine. There are also a number of interesting documents referring to early workings. It was a perusal of some of these documents which led to the reopening and working of the mine in the present era.

In October, 1911, a small company of Mexicans of Etzatlán formed a company and began the work of unwatering La Mazata mine. In April, 1913, they succeeded in getting to the bottom of the old mine and found some drifts still containing ore. Some of the narrow streaks of this ore, about 8 in. wide, assayed as much as 44 kg. of silver and 560 grams of gold per ton. The vein was found to be about 12 ft. wide between the standing walls, and to have an average value of more than 300 pesos across its entire width. A legend among the Mexicans is that at the time of the abandoning of the mine by the Spaniards they were working on ore about 600 ft. further south, which was very much richer than the ore in that part of the mine at present opened. These legends exist about all inaccessible workings, and usually have little basis on fact. They increase with the years and depth of submersion.

About 2000 ft. south of the La Mazata mine is La Proveedora mine, also an old one, apparently located on the junction of the Santa Cruz vein with that part of the Mazata vein owned by La Proveedora Mining Co. A short tunnel which was driven to explore the veins on this property, cut them about 30 ft. from the surface and found ore in a 5-ft. vein, some streaks of which were sold to smelting plants for about 500 pesos per ton. The average of ore in the vein is said to be about 40 pesos per ton exclusive of the high-grade material.

The district may be called a newly discovered old one and is well situated between two railroad lines, not over 10 miles from either. There are good wagon roads to railroad points and the average elevation is about 5250 ft.

The Mazata vein strikes N.W. about 45° and dips about the same number of degrees N. E. It averages from 2 to 9 m. in width, has well defined walls and contains a banded filling of quartz with black silver minerals, sulphides and sulphide combinations. The country rock near the outcrop is principally green andesite containing augite and olivine gabbro. Beds of lava cover many parts of the district, obscuring the vein outcrops.

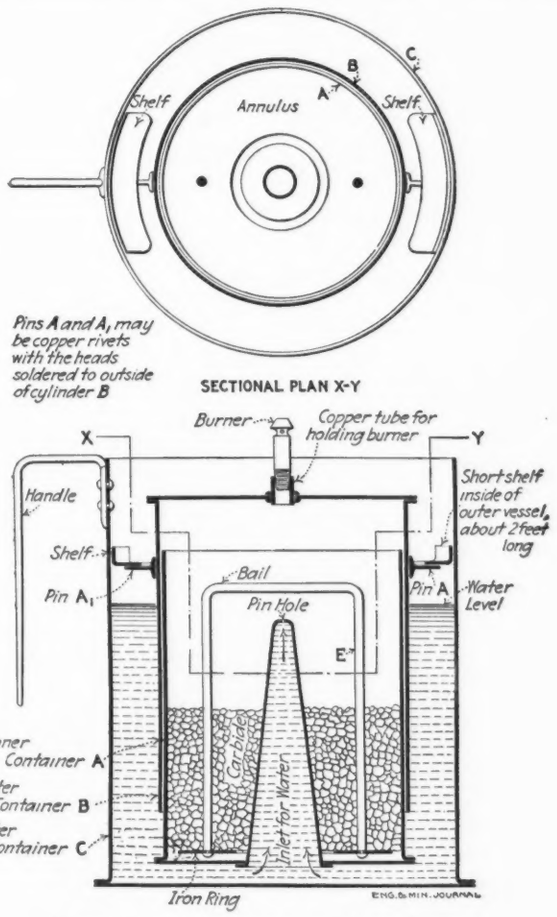
*Etzatlán, Jalisco, Mexico.

DETAILS OF PRACTICAL MINING

A Home-Made Acetylene Lamp

By A. Livingstone Oke*

The accompanying drawing illustrates an acetylene lamp which can be readily made in the mine shop and is suitable for use underground. I have had this type of lamp in use for several years in a mine in the Argentine Republic, and found it to be more durable in the hands of native miners than the usual type sold for underground work. The lamp consists of four parts: An inner cylinder, or container *A*, open at the top and with



Home-Made Acetylene Mine Lamp

a tapering tube for the inlet of water, soldered in the bottom; an iron ring lying at the bottom of this cylinder and fitting loosely round the tapering tube, to which is riveted a piece of stout iron wire in the form of a bail. A second closed cylinder *B* is inverted over the inner cylinder *A*, and the two make an easy, sliding fit. An outer water can is provided, having a hook attached to one side for carrying and hanging up, and a couple of little strips of tinned iron soldered on opposite sides about 2 in. below the top edge, as shown. The action is as follows: The ring is first placed in the cylinder *A*, and the can then half filled with carbide. The bail riveted to the ring projects above the surface of the carbide, over the top of the tapering inlet tube. The cylinder *B* is now placed on as a cover to the carbide chamber and pressed down nearly as far as it will go. The two are placed in the outer can, which has water in it. Cylinder *B* has two pins projecting about an inch below the top, on each side, and these fit under the two little projecting shelves soldered to the outer can. Without this arrangement, the inner cylinders would float.

The water level in the can should be sufficiently high to make the water flow in on the carbide from the inner tapering tube, according to the size of the flame desired; by adding more water, more light is obtained. The object of the annulus and bail is to allow the spent carbide to be pulled out and obviate digging it out with some pointed instrument. This little attachment enormously increases the life of the lamp, as it is in removing this carbide by the miners that its worst treatment is received. The lamp may be made of zinc, brass or tinned iron and the stouter the material the better.

A charge of 300 grams of carbide, using a 28-liter burner and a small head of water, will last 3 hr. In drifts and workings for one or two miners only, the one-point 12½-liter burner is more economical. To stop generation of the gas, the water is poured off or the inner two cylinders taken out of the water can.

*Naraguta, North Nigeria.

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Compressed-Air Locomotives for Inspiration Company

The Inspiration Consolidated Copper Co. has placed an order for six compressed-air locomotives with the H. K. Porter Co. A high-pressure Ingersoll-Rand compressor has also been purchased with sufficient capacity to serve 14 of the locomotives, which is the number it is expected eventually to employ. The locomotives are 10-ton machines of the two-stage type. The main storage tank is charged with air at a pressure of 800 lb. from charging stations conveniently located about the mine and connected by pipe line with the compressors. The air in the pipe line is carried at 1000 lb. in order to provide a reserve supply available for charging the locomotives immediately and rapidly. It is estimated that with the design of charging station used, the locomotive will be able to come to rest, receive a charge of air, and be in motion again in 90 seconds.

The air from the engine reservoir is dropped by means of a reducing valve to 250 lb. before it enters the high-pressure cylinder. In this cylinder it expands from 250 lb. to 50 lb., and performs approximately one-half of its work. By this expansion the temperature is dropped to about 140° below that of the surrounding atmosphere, and to restore it approximately to atmospheric temperature before entering the low-pressure cylinder, it is passed

through an interheater, which consists of an elongated cylinder filled with small tubes through which atmospheric air is drawn at high velocity by means of a draft induced by the low-pressure cylinder exhaust. The low-pressure cylinder has about four times the volume of the high-pressure and exhausts the air at atmospheric pressure. It is stated that numerous tests have demonstrated that this type of compressed-air locomotive under average conditions is 50% more efficient than the old-type single-expansion machine.

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Three-Stage Hoisting System

At the time of forming the Crown Mines, Ltd., on the Witwatersrand, there were, on the seven properties taken into the consolidation, 11 principal shafts of various types. The scheme of centralization of operations, which was applied, involved the concentration of hoisting in two main shafts, of which No. 5 was a seven-compartment, vertical shaft; No. 7, a turned-vertical, four-compartment shaft.

Previous experience on the Rand has shown the inefficiency of the turned vertical type of shaft. The methods of transportation installed by the new company rendered the straight vertical type with long crosscuts most available, but it was deemed wise to use the existing incline portion of No. 7 shaft. The vertical portion was 1085 ft. deep, the inclined portion 2004 ft., reaching to the 13 level. In remodeling the shaft, says R. C. Warriner (*Journ.* So. Afr. Inst. of Eng., April, 1913), the vertical portion was deepened 120 ft. and the pumpway was converted into a fourth hoisting compartment. At the turn a second set of hoists was put in to operate the skips on the incline only. A large 1000-ton orebin was cut at the turn into which the four inclined skips dump and from which the four vertical skips pick up their loads. This conversion into a stage-hoisting system was accomplished with difficulty, as hoisting operations could not be greatly interfered with. Fig. 1 shows the general arrangement at the turn.

Below the 13 level, a second inclined hoisting system is being installed. The object of breaking up the incline hoisting thus into two stages is to maintain the capacity of the shaft at the present figure. Fig. 2 outlines the manner of installing the third-stage hoists and the mode of transferring the ore to the second-stage skips.

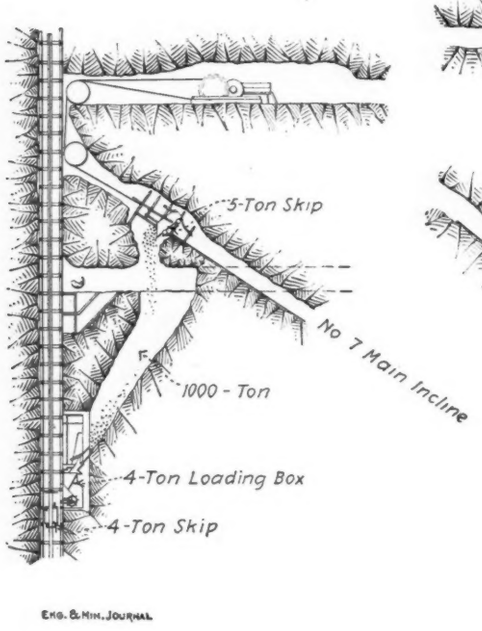


FIG. 1. TRANSFER POINT AT BOTTOM OF VERTICAL SHAFT

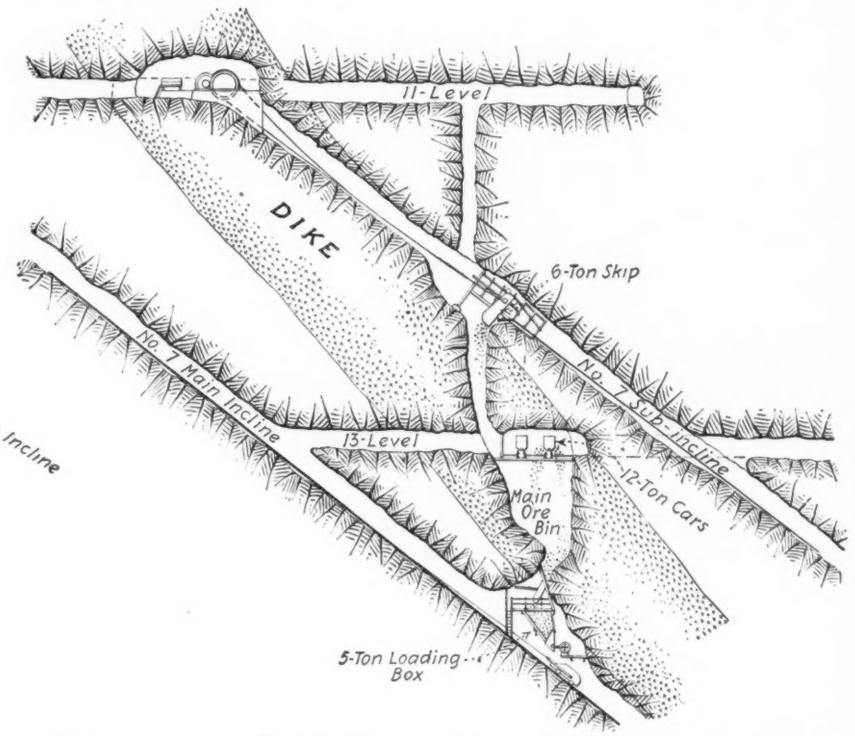


FIG. 2. TRANSFER FROM THIRD STAGE TO SECOND STAGE

Safety Rules—Handling Explosives*

(1) No one shall be allowed to handle or assist in handling high explosives in any way until he has received instructions satisfactory to the superintendent or mining captain.

(2) Great care should be taken in handling and opening boxes of dynamite. Use a wooden mallet and a wooden wedge. Avoid friction and blows as much as possible and never open the box in a storage house or magazine.

(3) Suitable carrying boxes to hold not over 50 lb. of dynamite, and to have a self-closing cover should be provided for all men handling dynamite. The words, "For Dynamite Only" should be stenciled on each box.

(4) Dynamite carrying boxes for open-pit work should be made as near frost proof as possible.

(5) No explosive should be taken into any mine except in a securely covered case. Explosives and caps should not be transported together.

(6) No explosives should be carried in electrically operated cars.

*From Inland Steel Co.'s book of rules.

(7) Dynamite, fuse or caps should not be left in a wet place, or permitted to lie around loose in working places.

(8) Do not smoke or carry a lighted candle in your hat when handling dynamite or caps, or when making up cartridges, as hot grease may drop on the caps or powder and cause an explosion. Place your candle 2 or 3 ft. to one side.

(9) Skewers are furnished for the use of all miners handling explosives and no other instrument should be used for inserting the fuse.

(10) Caps are extremely sensitive to heat, friction or blows. Do not drop them or strike them against any hard body. Do not lay them where they may be stepped on and do not carry them in your pocket.

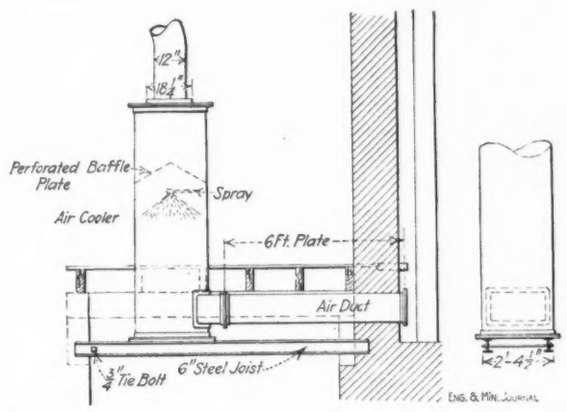
(11) Place caps on fuse at the place where they are stored, and never near dynamite or powder.

(12) When crimping caps the greatest care should be taken not to squeeze the explosive composition and they shall never be crimped with the teeth; there is enough composition in one of these small capsules to blow off a man's head. Cap crimpers must be used in all cases.

❖

Compressor Precooler and Scrubber

The advantages of cold and clean air for compressing purposes are well recognized. When cold, a larger weight of air can be taken in for each stroke and the fact that air is clean reduces the wear on the valves and other parts of the machine. The illustration shows a device employed by the Broken Hill South Silver Mining Co., in Australia. It consists of a cylindrical upright cooling shell with a horizontal duct leading from the outside air; the duct is made of sheet steel and has a rectangular section. Rising through the cooler, the air is met with a downwardly directed spray of water from a cooling tower. The effect of this is to reduce the temperature of the air to the lowest possible point under existing atmospheric conditions, and at the same time to wash out all dust and foreign material.



SPRAYING ARRANGEMENT FOR COMPRESSOR INLET

[It would seem as if the effect of the spray described would be to load the incoming air with almost a maximum of moisture, and it is recognized that such saturated air is more likely to give trouble from freezing when used afterward in machines. The cooling and cleaning, however, are excellent features and are points too often neglected in mining practice.—EDITOR.]

Mesabi Station Cutting

Mesabi conditions render it expedient to install relatively simple and inexpensive shaft stations and loading pockets. The method of driving and timbering these, as given by Charles E. van Barneveld, in "Iron Mining in Minnesota," is interesting. It should be borne in mind that the formations cut are likely to be soft.

After selecting the level at which it is desired to cut the station, lines are given for two 5x7-ft. drifts out from the side of the shaft near the ends. These lines are 12 in. inside the corner posts. At the same time a 4x4-ft. raise is started in the center of the shaft at a point 20 ft. below. The relation of these workings is shown in Fig. 1. The raise runs up along the shaft, and as blocking and wedges are encountered they are removed, the lagging being nailed to the wall plates. The raise is holed through to both drifts and is used as a chute and pocket for material excavated thereafter.

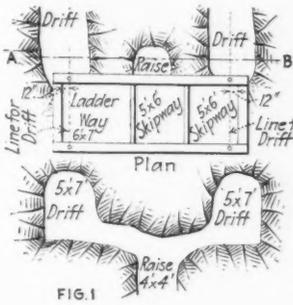


FIG. 1

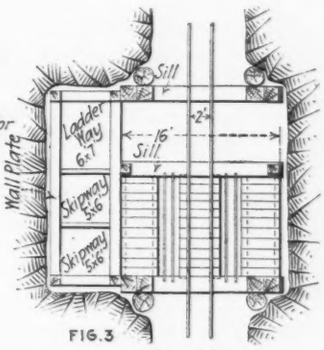


FIG. 3 Plan C-D

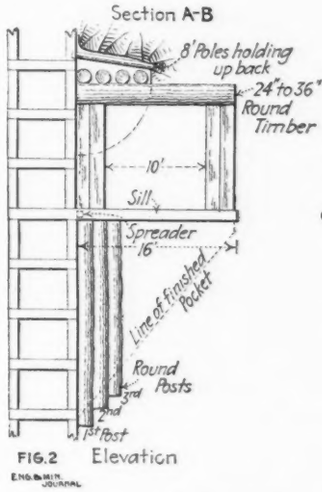


FIG. 2 Elevation

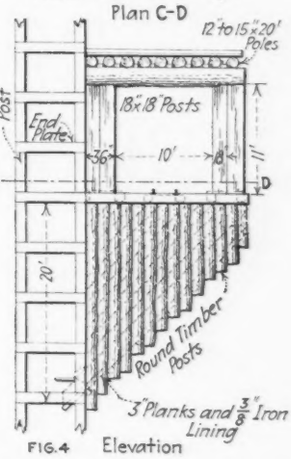


FIG. 4 Elevation

OPENING AND TIMBERING A TYPICAL MESABI STATION

The drifts are run for a length of 16 ft. A sill is laid along the length of each drift, at right angles to the wall plate, the sill tops being flush with the tops of the wall plate, against which they abut. The drift backs are then taken down for a total height of 15 ft. Caps are set to correspond to the sills, being of heavy 24- to 30-in. round timbers, 16 ft. long, framed to 10 ft. between the shoulders. Four posts, 18 in. square, support each cap, two at each end. This timbering is shown by Figs. 2 and 4, in side elevation.

The block between the drifts must be taken out with care. A top cut is taken out first. This is begun at the shaft side and is cut out for about 2 ft. above the station set, the portion removed being that included in the

dotted line of Fig. 2. The back over this is caught up with 8-ft. poles from the shaft sets as shown. When the excavation gives room, 12- to 15-in. round poles, reaching across the two drift sets and parallel to the shaft, are put in. These would be about 20 ft. long. A small drift is also usually started along the station side to make room for handling these long sticks. The poles are spaced as shown, being held apart by small blocks and covered with a double layer of boards with their joints broken, as shown in Fig. 4, an elevation of the finished station. The remainder of the top of the block is taken down in similar fashion and then the bottom section is removed. With the station thus opened, a third main set, similar to those first placed in the side drifts, is put in as shown in the plan of the station, Fig. 3, opposite the divider of the ladderway. The wall plates between the bottom and top of the station and opposite it are cut off against the shaft-set posts, raised and fastened.

The pocket is cut under the station opposite to the hoisting compartments. As it is cut back from the shaft, posts are stood up next the shaft and opposite the shaft posts, so as to support the two station sills undercut by the pocket excavation. These posts extend 2 or 3 ft. below the pocket bottom. As excavating proceeds, other posts are placed against the first and tightly wedged in place. The two station sills are held apart at each end by 12-in. square timbers, as cross-sills, and four 16-in. square cross-sills are also mortised into the station sills. The pocket is lined with 3-in. plank covered with a wearing plate of ⅜-in. sheet iron. Quarter-pan gates are used for loading.

❋

Use of Multiple Detonators

With long charges of high explosives in blasting work, it has sometimes been the custom to place detonators at intervals in the charges, in the belief that the work accomplished by the explosives would be increased. The results of an investigation of this subject are published in the U. S. Bureau of Mines, Bull. No. 59. Tests were made with insensitive dynamite, measuring the rate of detonation of different charges through which variously spaced detonators were distributed. The results indicate that extra detonators distributed 5 in. apart in the cartridge file of an insensitive explosive 40 in. long have a slight tendency to increase the propagation of the explosive wave, but that extra detonators spaced 10 in. apart offer no advantages. With an insensitive dynamite, such as that used, the influence of the detonator probably did not extend further than 5 in., and since the explosion wave and the detonation of the explosive surrounding the detonator probably precedes that of the detonator, it is evident that the latter would have no effect upon the detonation of the charge. It should be noted that these detonators were placed by themselves without fuses.

It is, however, often advantageous to fire simultaneously two or more electric detonators placed in different parts of a long charge. Under such conditions, the time of detonation is reduced and the shattering effect increased. In a 6-in. by 100-ft. churn-drill hole in a quarry, filled with explosive for 30 ft. from the bottom, it has been found that one electric detonator on top of the charge will not always produce a complete detonation throughout the charge and two or more detonators are therefore often distributed. In such a charge, 30 ft. long, a violent effect is obtained by placing one electric detonator 5 ft. from the bottom, one 5 ft. from the top and one in the center of the charge. By this means, the time consumed in the entire explosion is reduced to one-sixth and the force of the explosion greatly increased.

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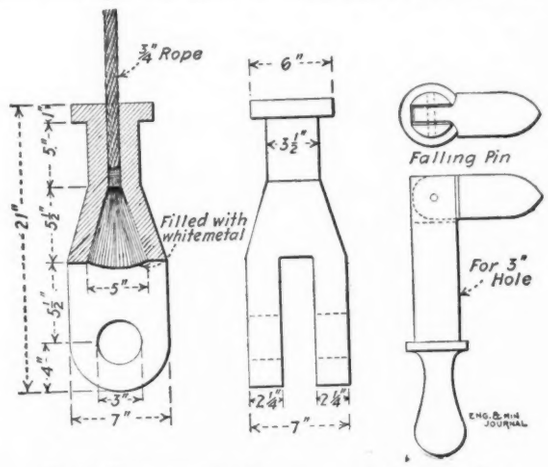
Sinking Bucket Connection

For sinking two large vertical shafts for the Brakpan mine on the Witwatersrand, according to C. B. Brodigan (Sir Clement Le Neve Foster Memorial Lecture) it was decided to use buckets for sinking instead of skips in order to obtain greater speed. The connection between the rope and the bucket was of the form shown in the accompanying illustration. This is not an unusual connection, but its suitability and safety are often discussed, and it is interesting to note that in this case no difficulty and no accident resulted from its use. The rope is pulled through the hole, the end untwisted and the individual wires separated to form a brush, which is cleaned by washing with caustic soda and emery. The wires are dipped into zinc chloride and then into molten tin. The thinned brush is pulled back into the cone sheath and white metal of good quality poured in to fill the spaces. The clevis connection shown is called a "falling pin." It proved to be quick, safe, and satisfactory in every respect.



ROPE SOCKET AND REMOVABLE CLEVIS PIN

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Butte Fuse-Cutting Method

An ingenious method of cutting fuse is employed in Butte shaft-sinking operations. It is customary to put two fuses in each shot, and in order to get the proper length of fuse, two nails or hooks are driven in wood the proper distance apart and the fuse wound tightly around them till a sufficient number of fuse lengths will be obtained (A. I. M. E. Bulletin, August, 1913). They are all then cut at one nail and on all the cut ends caps are placed. The sharp bend where the fuse passed over the other nail marks the center point of each length of fuse. Both ends of each length of fuse are put in the same primer and the fuse is not cut for spitting until the last minute. This provides against accidental moistening of the powder in the cut ends. No attempt is made to time the shots by cutting the fuse of different lengths, since the operation of spitting is sufficiently slow to give the proper sequence.

DETAILS OF METALLURGICAL PRACTICE

Safety Rules—Fire Prevention*

(1) Maintain order and cleanliness. Many fires are due to untidy conditions. Inspect premises daily and do not allow empty boxes, barrels, waste, etc., to accumulate, but dispose of them promptly.

(2) Ashes should never be emptied into other than metal receptacles, and should be kept away from frame buildings, etc.

(3) Oily waste, etc., oxidizes rapidly and should not be allowed to lie around, as spontaneous combustion may occur.

(4) Sawdust and other combustible material should not be used to catch oil drippings, or in cuspidors. Use sand placed in metal pans.

(5) Soap solution should be used as lubrication for cutting tools, wherever practicable, instead of oil.

(6) Use safety matches instead of parlor matches, as the heads of parlor matches often fly off when igniting.

(7) Kerosene lamps, lanterns, torches, etc., should be filled by daylight only, and never filled while burning.

(8) Do not allow incandescent lights to rest on combustible material, or anything combustible to be hung on electric lights. Paper shades should not be used. Extension lights having long wires which are hooked over rails, etc., are dangerous, as insulation is liable to wear off and cause short-circuiting.

(9) Never replace blown-out fuses with wire.

(10) Stove pipes should not be run through floors or partitions. Provide a chimney. Floors and woodwork near stoves should be protected by metal, brick or cement.

(11) Inspect chimneys at regular intervals and repair defects.

(12) So far as possible fireproof materials should be used in all construction work.

(13) Lumber piles, etc., in dry summer weather should be kept wet.

*From Inland Steel Co.'s book of rules.

Guest Reduction Process

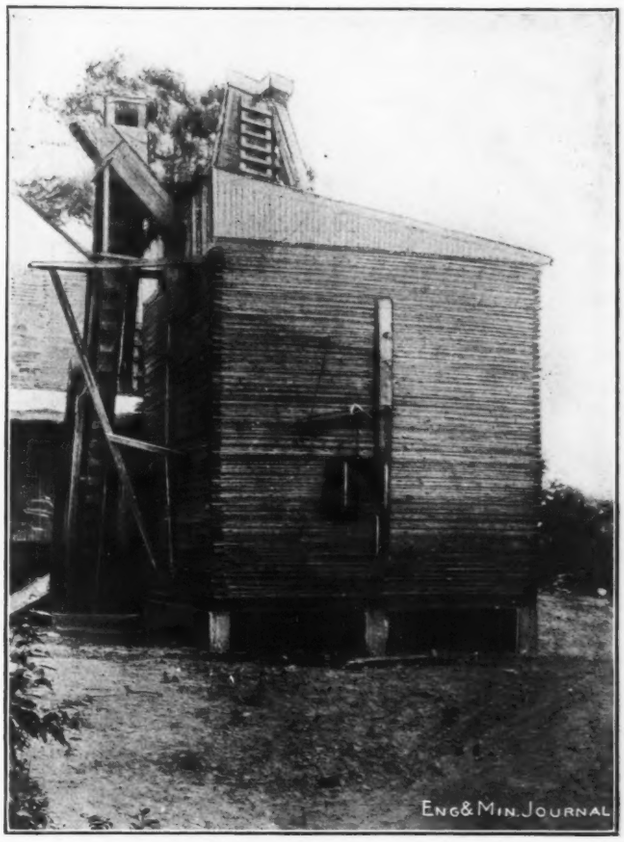
A patent has been granted to W. W. Guest, of Alameda, Calif., for a method of recovering precious metals from ores in which they occur in chemical or mechanical combination, the process being applicable to black and other sands.

The method consists in grinding the ore in a solution containing a combination of the nitrates, hydrates, chlorates, hyposulphites and hypochlorites of the alkaline metals. A combination of any three or more of these compounds, dissolved in water in the proportion of 20 to 80 grams per liter, depending on the character of the ore to be treated, is mixed with an equal weight of the ore and the whole ground up into a slimy pulp. The bases are changed into soluble form, chlorates, sulphates, arsenates, arsenites, nitrates and hypochlorites of the base metals. These base elements, which obstruct amalgamation, are then removed, and amalgamation may be easily and rapidly effected.

This process is claimed to be effective in a short time and to recover a high percentage of the contained precious metal. It bears patent No. 1,067,022.

Crib Ore Bin

The ore bin illustrated is one employed for a tailing bin by the Mount Summit Ore Corporation, of Garrison, N. Y. Except for a few pieces, it is built up of



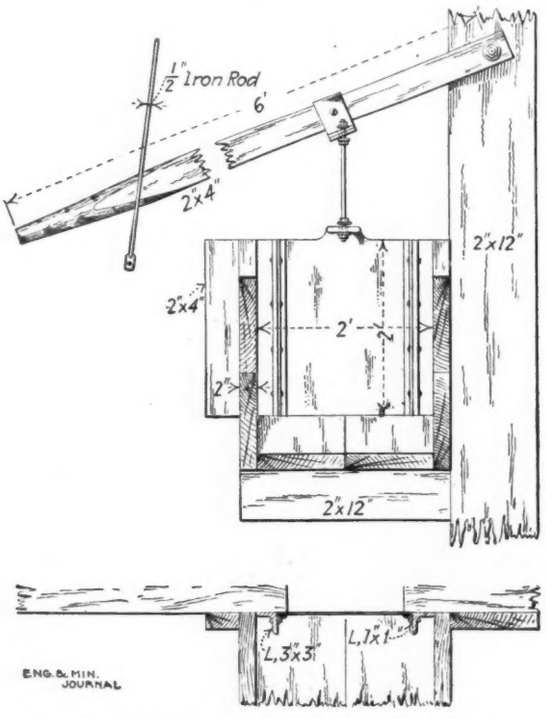
TAILING BIN OF 1x6-IN. LUMBER

1x6-in. material only. Typically, 2x6-in. stuff would be used, and is so used in other bins of the same property. The bin is 16x16x17 ft. outside, above the foundations. These latter are of concrete, three in number, 1 ft. thick. The bin floor laid on these is of the 1x6-in. material set on edge and spiked together, covered with a ½-in. layer of concrete. The sides are built up of the timber laid on its side, two planks together, lapping alternately at the corners. The successive layers are spiked down to those below. The sides are plumbed up as they progress just as a mason plumbs a vertical wall. Two ¾-in. tie rods in each direction through the bin are carried by

vertical 2x8-in. by 12-ft. pieces on the sides as shown. The bin is covered with a sloping galvanized roof.

Two bin gates of the vertically sliding type moved by a lever are set in two sides. The details of their construction are as shown. They are satisfactory on the fine, dry, smooth-running material which they are required to handle. The guides are made of a 3-inch angle bolted to the side of the bin and a 1-inch angle bolted to this so that the gate slides behind one flange of the latter. It is expected to keep the bin filled with tailing in the lower portion and draw it off as required down to the level of the chute bottoms. An exactly similar chute set in the bottom of the bin in a horizontal position permits the bin to be forked if desired.

The bin offers the advantage of rapid erection by relatively unskilled mechanics. No framing of timbers is required. It is not even necessary to cut the material to length, as the corners can be trimmed with a saw when erected. Rough hemlock is the material used in this case.



Sliding Chute Gate with Lever Action

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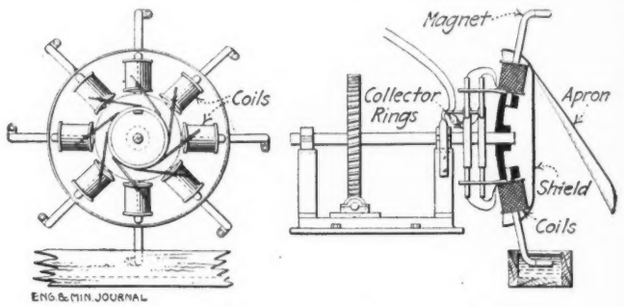
Copper Smelting in the Electric Furnace

Smelting sulphide copper ores in the electric furnace is summed up by Messrs. Lyon and Keeney (A. I. M. E., Bull. August, 1913), as follows: (1) The process consists of melting the charge, volatilizing about 60% of the sulphur in elemental form and separating slag from matte; (2) the ratio of concentration is simply that got by separating matte and slag by the reaction of oxides and sulphates upon sulphides and by volatilizing 10% more than one atom of sulphur, there being no formation of iron oxide to enter the slag, because there is nothing present to oxidize the iron sulphide; (3) qualitatively, some of the sulphur can be condensed; (4) copper loss, by volatilization and in the slag, is low; (5) the 1% copper matte from a 0.3% copper charge is a good collector for gold and silver if the slag separation be clean; (6) gold volatilization loss is small, silver is appreciable, but in a larger furnace with closer temperature regulation would probably not occur; (7) electrode consumption is small and in practice need not exceed 5 lb. per ton of charge; (8) in a large commercial furnace, power consumption for most ores would be about 480 kw.-hr. per ton.

⁂

Removing Iron from Pulp

A closed tube-mill circuit is part of the system of cyaniding concentrate at the mill of the Alaska-Treadwell Gold Mining Co., Douglas Island, Alaska. Unless some method is provided for removing iron from this circuit, it will accumulate, reaching as much as 15% of the total. To avoid this difficulty a magnetic device has been installed, which continuously removes all metallic iron from the pulp.



Magnet for Removing Iron from Pulp

In the launder which conveys the ground pulp back to the Dorr classifier for separation, a wheel, which consists of a number of magnets, is arranged, the ends of the magnets dip into the launder and remove the adhering iron, discharging it on an apron which carries it clear of the launder. Current is supplied through a simple commutator. The accompanying drawing shows the details of the arrangement.

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Precipitating Mossy Cement Copper

According to Henry M. Wilcox, of Chicago, Ill. (U. S. pat. 1,066,968), cement copper can be precipitated in a fibrous condition from sulphate solutions by the use of sufficiently large quantities of sulphur dioxide. This condition obtains when the weight of sulphur dioxide absorbed is approximately equal to the weight of metallic copper in the solution. This is done under superheat (i.e., under pressure), and may require the use of liquid sulphur dioxide, since if air is admitted with sulphur dioxide it is difficult to raise the required pressure.

⁂

The Attempted Dry Chlorination of Zinc-Lead Ores at Helena, Mont., is one of several metallurgical experiments that are being considered ("Met. and Chem. Eng.," Aug., 1913). Chlorine gas is the active agent employed in attacking the ore and rendering the metals soluble, after which they are recovered by steps in precipitation which are susceptible of considerable variation. It is expected that experiments on a commercial scale will be commenced this summer, and pending the actual operation of the process, no definite information is available for publication.

NOTES FROM CURRENT LITERATURE

Iron Conduit for Alternating-Current Lines

In a recent paper presented to the Elektrotechnischer Verein (abstr. *Elect. Rev.*, Aug. 2, 1913), L. Bloch discusses the conditions attending the running of cables carrying alternating current in iron conduit where the return line is not included within the same iron covering. It is found that the inductance of the pipe not only causes considerable impedance in the circuit, but that the eddy currents and hysteresis produce a marked wattage loss which raises the temperature of the conduit and this limits the carrying capacity of the cable to a lower value than it would otherwise have.

The general conclusions are stated as follows: When single-phase cables are laid singly in iron conduit serious troubles are likely to arise if the currents exceed 50 amp. and even at lower limits. The most notable effect is a rise in temperature, in addition to which the dropping voltage and the loss of power may have a serious effect upon the satisfactory working of the installation.

The investigation was occasioned by a serious case which occurred in Berlin, where a large number of heavy conductors carrying polyphase current were laid singly in iron conduit.

Progress of Electric Steel Industry

The industry of manufacturing steel electrically is progressing rapidly and a list of the furnaces operating in the United States is given in *Iron Age*, July 10, 1913. Seven of these furnaces are of the Heroult design and includes that of the Halcomb Steel Co., Syracuse, N. Y., a five-ton furnace producing tool steel; the Firth-Sterling Steel Co.'s furnace at McKeesport, Penn., of the same size and producing the same material; another belonging to the same company and at the same place, 2½-ton size, also producing tool steel; the Illinois Steel Co., Chicago, Ill., 15-ton capacity producing rails; the American Steel & Wire Co., Worcester, Mass., 16-ton, producing wire rods; National Malleable Castings Co., Sharon, Penn., 3-ton capacity, producing castings; Treadwell Engineering Co., Easton, Penn., 2-ton capacity, also producing castings.

Of the Girod design there is the one-ton tool-steel furnace of the Simonds Manufacturing Co., Lockport, N. Y.; the Bethlehem Steel Co., South Bethlehem, Penn., a 10-ton tool-steel furnace; the 3-ton furnace, producing castings, of the Washington Iron Works, Seattle, Wash., and the 5-ton castings furnace of the Portland Bronze & Crucible Steel Foundry, Portland, Ore. The Hering design includes the ½-ton castings furnace of the Niagara Steel Castings Co., Buffalo, N. Y., and the ½-ton tool-steel furnace of the Firth-Sterling Steel Co., McKeesport, Penn. The 2-ton castings furnace of the Crucible Steel Castings Co., Lansdowne, Penn., is of the Roechling-Rodenhauser design; while the ¾-ton castings furnace of Deere & Co., of Moline, Ill., is of the Kjellin type. The 1½-ton castings furnace of the Buchanan Electric Steel Co., Buchanan, Mich., is of the modified Stassano design, and the 1½-ton furnace of the Crucible Steel Castings Co., Milwaukee, Wis., together with the 1½-ton castings furnace of the Chicago Electric Castings Co., are designed by the Metallurgical Engineering Co., Chicago, Ill. The 1-ton special steel furnace of the Harrow Spring Co., Kalamazoo, Mich., is of the Greene induction type. The accompanying table shows the installations of electric furnaces by countries.

ELECTRIC FURNACES BY COUNTRIES

Countries	Number	Countries	Number
Germany	34	Spain	1
Italy	20	Mexico	4
England	16	Canada	3
France	13	Japan	1
Austria	10	Brazil	1
Sweden	6		
Russia	4	Total foreign	121
Belgium	3	United States	19
Norway	3		
Switzerland	2	Grand total	140

Volcanic Dust and Climatic Changes

A problem which has always engaged the attention of geologists, is rationally to explain the variations in the earth's climate which permitted the occurrence of the several glacial epochs. Of the explanatory theories advanced, those based on the varying eccentricity of the earth's orbit about the sun, on the assumed varying percentage of carbon dioxide in the atmosphere, on the waxing and waning of solar radiation, and on changes of elevation of the land surface, have all contained plausible elements and have claimed many adherents. They are all, however, open to objection. Writing in the "Journal of the Franklin Institute," August, 1913, W. J. Humphreys advances a new explanation, based on the prevalence or absence of volcanic dust in the atmosphere. He finds out from the falling velocity of the dust particles that they are of a size larger than the wave lengths of the direct solar heat, and smaller than the wave lengths of the heat radiated from the earth. Hence, the solar heat is largely reflected and scattered, and the radiated heat from the earth is allowed to pass through with little interference. As a result, a blanket of dust in the upper atmosphere acts in a manner exactly opposite to that of a glass cover, such as is applied to greenhouses, and tends to cool the earth below the temperature which would result if it were not present.

Following the exposition of this theory, Mr. Humphreys examines the records to find out how it corresponds with the facts, and by plotting curves, he shows that the mean annual temperatures of the earth and the annual amounts of heat absorbed from the sun, which themselves correspond more or less closely, show marked low points corresponding with the great historical eruptions, such as that of Krakatoa, Katmai, etc. A certain correspondence is also shown between the number of sun spots and the earth's climate, the occurrence of large numbers of spots corresponding to high temperatures on the earth and *vice versa*. This is shown to be consistent

with physical theory. The influence of the sun spots seems to be secondary to that of volcanic dust, but the two together have probably been the dominant, if not the sole, agencies in producing the variations of the earth's climate. A drop of only a few degrees, continued over a long period of time, would be sufficient to permit the encroachment of the polar ice sheets for long distances, and thus produce a glacial epoch. The total quantity of dust sufficient to cut down the intensity of the direct solar radiation by 20%, and if indefinitely continued, to produce an ice age, is astonishingly small, being only one 1500th part of a cubic mile, supposing that the particles are in large measure more or less flat. And this quantity of material would need to be distributed only about once in one or two years.

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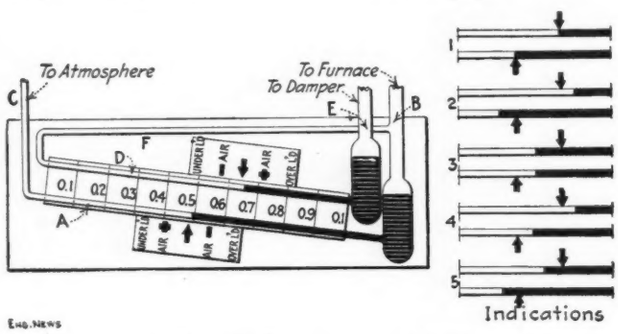
Boiler-Efficiency Indicator

Excessive fuel consumption, smoke production and irregular steam pressure result from failure to maintain boiler efficiency. A new device, now being introduced, noted in *Engineering News,* June 12, 1913, keeps the fireman informed of varying conditions and guides him in maintaining proper ones. It combines the duties of the CO_2 recorder, steamflow meter and draft gage.



A Boiler-Efficiency Meter

Characteristic Indications

1. Normal operation of boiler.
2. Too much air, fuel bed too thin, or holes in fire.
3. Too little air, fuel bed too thick, or fire choked with slag.
4. Boiler running with overload.
5. Boiler running with underload.

The operation is based upon the relation of draft conditions to the efficiency of the boiler. The CO_2 content of the products of combustion is a good indication of the efficiency of combustion, but it gives no indication of the capacity developed by the boiler. The draft conditions, however, afford a direct indication of both efficiency and capacity.

When a boiler is working at its normal capacity, a decrease in the normal draft resistance at the grate (due to a thin fire or to holes in the fire) will result in an increase in the drop of draft pressure through the boiler, and a consequent reduction in efficiency due to the excess supply of air. On the other hand, an increase in the normal resistance at the grate (due to heavy firing or failure to clean the grates) will result in a decrease in the drop of draft pressure through the boiler, and a consequent reduction in the capacity or rate of steaming. It results also in loss of furnace efficiency due to imperfect combustion.

The device shows the draft in the furnace and the drop in draft pressure through the boiler at the same time. It consists essentially of a pair of draft gages, the indicating portion being a pair of inclined tubes in which the movements of a body of oil show the variations in draft. The construction is shown in the accompanying drawing.

The lower gage tube *A* has a ⅛-in. pipe connection *B* to the interior of the furnace, just above the fire level, while the pipe *C,* from its upper end, is open to the atmosphere. Thus the gage *A* gives a direct reading of the draft or air pressure in the furnace, and shows variations in pressure due to heavy, light or dirty fire. The upper gage tube *D* is in a closed loop; its lower end is connected to a pipe *E* leading to a point just inside the damper at the smoke flue or uptake. Its upper end is connected by a pipe *F* with the furnace tube *B* of the other gage.

Thus the gage *D* is influenced by the pressure at the furnace and at the damper, and becomes a differential gage showing the drop in draft pressure between these points. A high reading on this gage indicates an excessive drop, while a low reading indicates too low a drop, due to an insufficient supply of air. The relations of the two gages indicate the causes of the defective conditions, some of which are indicated on the cut. In firing, the aim is to maintain the fluids in line with the respective arrows. This device is being introduced by W. A. Blonck & Co., Fisher Building, Chicago.

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A Disease of Lead

Some metals are known to be subject to deterioration through chemical and physical agencies. From the *Ironmonger,* reprinted in *Brass World,* July, 1913, is taken the description of a disease which attacks lead.

Oxidation began in one of the objects of art, wrought in lead, at the Cluny Museum, in Paris, and it was slowly being converted into a pulverized mass. Other specimens appeared unaffected. Investigation showed traces of chloride in the lead by means of which the alteration was promoted. Professor Matignon found chloride in all the affected pieces and showed that the disease could be produced in a sound specimen by rubbing it with chloride. The first symptom is a white speck, which is rapidly followed by others. If not suppressed, the condition spreads until entire destruction of the metal is threatened.

A disease of tin was noted in the Journal of Dec. 31, 1910, which was a disintegration beginning at 64° F. and reaching a maximum at —40° F. This change ceased at —172° F. and seemed to be due to low temperature alone. It began with small swellings of the metal and a change to powder with partial oxidation. The powder resulting from this change has the power to infect clean tin.

Another disease of the same general character was noted in the Journal of Feb. 4, 1911. This was a disease which occurred in tinplate, changing the coating and destroying it. It is explained that the crystallized form of tin is its most stable form, and that tarnishing of the coating of tinplate is often due to the change to it. It is said that this disease may be communicated not only to other tin, but also to copper, lead or polished rolls of almost any other metal. Infection proceeds rapidly at higher temperatures, in distinctly different from the "gray-tin" disease already mentioned, which is produced by low temperatures.

Lake Superior Institute Meeting

SYNOPSIS—Special correspondence from our representative, covering the Lake Superior meeting day by day.

The eighteenth annual meeting of the Lake Superior Mining Institute, which was held on the Mesabi range, Aug. 26-30, was one of the most notable gatherings of mining men ever known to the north country. It was attended by over 300 members and guests, who thoroughly enjoyed the trip and reaped a great deal of benefit from their observations. The social features were the best ever given in connection with an Institute meeting, all of the entertainments being excellent. The Institute meeting is the annual vacation for a large part of the mining men of the region and they forget their cares for a few days. The Minnesota mining men are royal entertainers and exerted themselves to the utmost in order that their guests might go back to their homes with the best kind of an impression of the greatest iron-ore district in the world.

The Minnesota Steel Plant

The members of the Institute assembled at Duluth on Tuesday morning, headquarters being at the Spalding Hotel, and left shortly after noon by the boat for the plant of the Minnesota Steel Co., on the St. Louis River, nine miles from the heart of the city. The company is a subsidiary of the United States Steel Corporation and was organized but a few years ago. The plant is still in the construction stage and will not be ready for manufacturing steel for another year at least. It is on a tract of 1500 acres, with two miles of water-front, and has connections with all of the railroads entering Duluth and Superior.

Some idea of the magnitude of the plant can be obtained from the present plans, which call for two blast furnaces with 500 tons daily capacity each; 90 Koppers-type byproduct coke ovens; 10 openhearth furnaces, rated capacity 75 tons each; four 4-hole soaking pits; one 40-in. reversing blooming mill, steam driven with low-pressure turbine-generator set; one 28-in. finishing mill, motor driven; one 16-in. continuous roughing train, motor driven; power house of 10,000-kw. capacity; five blowing engines, gas driven, 20,000-cu.ft. capacity each; machine, forge and structural shops; three continuous reheating furnaces, regenerating type, end discharge, designed to use 16-in. billets; established daily capacity 1000 tons ingot.

All buildings have steel frames, inclosed with two-piece concrete blocks. The company is also erecting 175 homes, containing 350 apartments for the mill employees. A cement plant with a capacity of 4000 barrels daily will also be constructed. The mill is going to be a great thing for Duluth, as it will be the means of bringing other industries associated with the steel business to that section.

The Eastern Mesabi

Three trains, one composed of sleepers and dining cars, the other two of private cars, left Duluth at midnight for the Eastern Mesabi range and the first stop was made at Biwabik. The Biwabik mine, the second property to ship ore from the Mesabi district, was inspected there. The mine was opened in 1891 and is about exhausted, having produced millions of tons of iron ore. A crushing plant with a daily capacity of 1000 tons is operated to take care of the hard ores.

Seventy automobiles transported the party from Biwabik to Eveleth, making a stop at the Genoa mine, which has been worked by steam shovels for the last year. The pit is a deep one and a large part of the ore is now mined by the milling system and taken to surface through shafts. The pits often are mined to such a depth that the cost of steam-shovel mining is prohibitive and other means have to be resorted to in order to get out the ore.

The Norman pit at Virginia, where the next stop was made, is the deepest pit mine in Minnesota, having reached a depth of over 300 ft. It is a mammoth hole that excited the interest of the visitors who had not seen it before. The Union and Commodore pits, which are near the Norman, were also inspected.

A Mammoth Saw Mill

One of the most interesting features of the trip was a visit to the big saw mill of the Virginia & Rainy Lake Co., one of the largest lumber concerns in the country. The plant covers over 300 acres of ground and employs 1400 men. It has a capacity of 1,000,000 ft. of lumber per day. The mill is modern in every respect and it is interesting to see the way logs are taken from the water and sawed and finished. The waste is extremely small. The company has its own well equipped fire department. The trip was a novel one because few of the party had the least conception of how a modern saw mill worked, although all were familiar with the old methods, as the Lake Superior region was well supplied with small mills at one time.

The Institute members were next taken to the ball park, where a baseball game between the two Virginia teams provided amusement for almost two hours. Following, an elaborate dinner was served at the Elks club, after which there was a business session in the high school. President Pentecost Mitchell presided and a number of the papers were read and discussed, some of which will appear in the Journal columns.

The First Open Pit

Thursday morning an automobile trip was taken from Virginia to Hibbing, a distance of about 25 miles, making stops en route at the Mountain Iron mine, where the first ore was mined on the Mesabi, and at the Monroe. The mine is now idle, the orebody having been exhausted. A total of 17,198,871 tons of ore were shipped in the 20 years during which operations were conducted. It was at this property that steam shovels were first used in the mining of ore by John T. Jones, of Iron Mountain, one of the pioneer Mesabi miners. For years the Iron Mountain was the largest iron mine in the world, a position now held by the Hull-Rust at Hibbing. The Monroe is idle at present, but work will be commenced shortly, as the mine is on the Hill lands under lease to the Oliver Iron Mining Co. The stripping has all been done and ore can be sent out within a few days after operations are resumed.

Immediately upon arriving at Hibbing, the visitors were taken to the St. Louis County Fair to witness the horse races, which proved exciting in spite of the wet track.

In the evening there was a wrestling and boxing exhibition at the Armory, which was a real treat. A scientific boxing match is always a good drawing card and every visitor was on hand early to get a seat near the ring. The pugilists were from Minneapolis and St. Paul and fought like wild cats until the referee stopped the bout because of a foul blow.

The World's Greatest Iron Mine

Thursday morning the members were taken to the Hull-Rust, Mahoning and Buffalo & Susquehanna mine on flat cars provided with seats so that they might get a better view of the operations. The Hull-Rust is the world's greatest iron mine, having produced 20,958,235 tons since it was opened less than eight years ago. Anyone who has not visited the mine has no idea f the magnitude of the operations in that pit. Close to 4,000,000 tons will be sent out from this mine alone this season, as much as will be sent out by all the properties on the Marquette range. The Hull-Rust has about 300,000,000 tons of ore in sight and there remains about 18,000,000 cu. yd. of stripping to be done. A part of the orebody lies under the city of Hibbing and it is quite likely that a part of it will have to be moved in the near future. The pit is now 90 ft. deep at the lowest point and the orebody extends downward for 100 ft. in some places. The ore is of excellent grade, part of it running 65% iron which contains little phosphorus. The ore is mined and loaded for about 15c. per ton, a remarkably low figure. The Buffalo & Susquehanna is a new property, which shipped its first ore last year, one year ahead of expectations. The overburden was 140 ft. deep and was removed in record time. Drills have located ore at a depth of 700 ft. and if mining is carried that far, the mine will be the deepest on the Mesabi.

The Western Mesabi

After the inspection of the mines of the Hibbing district the trains left for the Western Mesabi to visit the properties there and the washing plants at the Hawkins property and at Coleraine. Stops were made at the Crosby, Stephenson, Hill, Holman and Canisteo mines.

A large portion of the ores on the Western Mesabi occur mixed with sand, making it necessary to build washing plants to remove the worthless material and bring the ore to merchantable grade. There are plants now at Coleraine, at the Hawkins, at Nashwank, and one will shortly be built by the Cleveland-Cliffs Co. at the Crosby.

The Coleraine plant is a large one, consisting of five units, each unit containing the following: One receiving bin; one 20-ft. revolving screen, 2-in. holes; one picking belt; two 25-ft. log washers; two 18-ft. "turbo" washers; 20 Overstrom tables and one shipping pocket, together with the necessary settling tanks, rock bins, sand pumps and driving mechanism. Each unit is operated by a 100-hp. motor. The capacity of each unit is 4000 tons of crude ore per day, or a total of 20,000 tons per day.

The power plant contains six 72-in.x18-ft. horizontal tubular boilers with tile stack; one 26x52-in. and 16x48-in. Prescott, cross-compound, condensing pumping engine; capacity 12,000,000 gallons, delivering through a 30-in. steel main to mill; one 26- and 52x48-in. cross-compound, condensing, Corliss engine, direct connected to 1250 kv.-a., 6600-volt, 60-cycle generator and the necessary exciter sets (switchboard, transformers, etc.).

Following the visit to Coleraine, where Friday night and part of Saturday was spent, the members returned to Duluth, reaching there Saturday afternoon. Most of the visitors left for their homes that evening.

W. H. Johnston, of Ishpeming, was elected president of the Institute for the coming year and the next meeting will take place on the Marquette range unless a trip be taken to some district outside of the Lake Superior field. E. W. Hopkins, of Commonwealth, and A. J. Yungbluth, of Ishpeming, were reëlected treasurer and secretary, respectively. The Mesabi meeting was the most successful of all the 18 meetings and will be remembered with a great deal of pleasure by those who attended.

Ore Treatment on the Mesabi

It is a mistake to suppose the Mesabi to be strictly a high-grade camp, to use gold-mining terminology. A certain amount of crushing and drying is frequently necessary and some concentrators now in use will probably be followed by others.

At the Biwabik mine, which has the distinction of being the first mine on the Mesabi range to use the steam shovel, much of the ore, a high-grade bessemer, requires crushing ("Mining Methods on the Mesabi Iron Range," a paper presented at the Minnesota meeting of the Lake Superior Mining Institute, August, 1913). Recently a new crusher of the gyratory type, with a 48-in. receiving opening, has been put in operation. It has a capacity of 1000 tons per hr. and is the largest gyratory crusher that has ever been installed.

On the western end of the range, many of the orebodies contain layers of fine sand, lean ore and broken taconite, which must be separated from the ore in order to make it merchantable. After several years of experiment a large concentrator was erected on the east side of Trout Lake, at Coleraine, by the Oliver Iron Mining Co., and this has been in successful operation since 1909. The Wisconsin Steel Co. also erected a concentrator at Nashwauk, consisting of two units, which began operations in 1912.

At the Leonard, Shenango, Commodore and some other pits, low-grade material containing 35 to 49% iron is being stockpiled. This material is unmerchantable at the present time and being mostly paint rock it will probably not yield to concentration.

At the Brunt mine, Mountain Iron, a drying plant is in operation for removing the excess moisture from the ore. The moisture is being reduced from 18 or 20% down to below 8%, resulting in a considerable saving in freight charges and rendering the ore more acceptable to the furnacemen. Another drying plant is in course of erection at the Whiteside mine.

German Southwest African Diamond Mines—among them the Zillertal, New Karlstal, and New Phœnix—which, owing to the former prohibitive tax on diamond production, had to close, have, since the lighter taxation came into force, resumed working. At the same time the stress caused by the scarcity of native labor has been relieved by the arrival of 400 Ovambi boys. The efficient exploitation of the Northern field, too, is considered assured, the Koloniale Bergbaugesellschaft, a financially strong concern, having in April acquired the mining and prospecting concessions of the Diamantfelder-Verwertungsgesellschaft for $31,250 cash and 55% of the net profits to be earned.

CORRESPONDENCE AND DISCUSSION

Motor Trucks for Mines

Our experience with motor trucks may be of interest to other mining companies contemplating the purchase of a truck.

In October, 1912, we ordered a Mack 5-ton truck with automatic-dump body, and a 5-ton trailer with hand-dump body. These were to be delivered about Nov. 1.

Our mine is two miles from the Nevada Copper Belt R.R. and 1000 ft. higher, with a good road between. After ordering the truck, men were put to work on the road, widening it for the broad-gage of the truck, cutting off corners to eliminate sharp turns, and putting it into the best possible condition, in order to give the truck a fair trial. The grade is in favor of the load the entire way. There are a few steep pitches coming up hill, the final stretch to the ore bins averaging 14% for 2000 ft. The road is the best ore road in this district and far better than most mountain roads. There is no sand, although the dust is thick in dry weather.

The truck arrived about Nov. 25, and was immediately put to work. It had been claimed that it would make eight round trips, with the trailer, in an 8-hr. day, and haul 10 tons each trip, five on the truck and five on the trailer. After the first day with the truck alone, the trailer having not yet arrived, it was evident that if it made six trips it would be doing well. After a few days the defects began to show, and it could not keep up an average of even six trips.

Rubber tires quickly proved themselves unsuited, as the small, sharp pebbles, which could not be kept off the road, chewed off the rear tires at the rate of about one a week. It took at least a half day to change these. The brakes proved too weak to hold the truck going down hill, and it was necessary to run part of the way on compression. After the first week, the brakes needed relining every two days to get any service from them. This was done after dark, so that no hauling time was lost. The gasoline and oil consumption ran far ahead of all estimates, although the driver sent in by the selling company was an experienced man.

After running for three weeks, during which time the trailer was expected daily, the hope of hauling ore with the truck alone was given up. It could not be depended upon to haul regularly, and the costs ran considerably above $1 per ton, without figuring depreciation. As against $0.55 per ton with teams this was pretty poor.

For some time we had heard of the specially designed trailer, a cut of which appeared in the JOURNAL, Feb. 1, 1913, p. 278. It arrived in the middle of January, 1913. This trailer alone weighed three tons, and the running gear looked as if it had been designed for a 15- or 20-ton body—it would certainly carry that load without any trouble.

A trial trip was begun with the truck and trailer, but never finished. Before the truck was a quarter of the way up the hill, it had boiled most of the water from the radiator, and it was necessary to go back. The only way the trailer got to the mine was when it was hauled up with a six-horse team and loaded. It carried 4½ tons, when greatly overloaded. Needless to say, the teams are back hauling on the road now.

From our experiences, it seemed that if the trailer had been properly designed, and the braking could have been done with it alone, thus taking all strain off the engine, there would be a chance for success. This would again be dependent on finding a suitable tire for the truck, rubber certainly will not do. It would also be well if the manufacturers would study the conditions under which the truck hauling ore must operate. It is hard to conceive of our trailer operating successfully under any conditions.

O. H. SONNE, President,
McConnell Mines Co.

Mason, Nev., June 25, 1913.

Historical Note on Smelting Lead and Silver

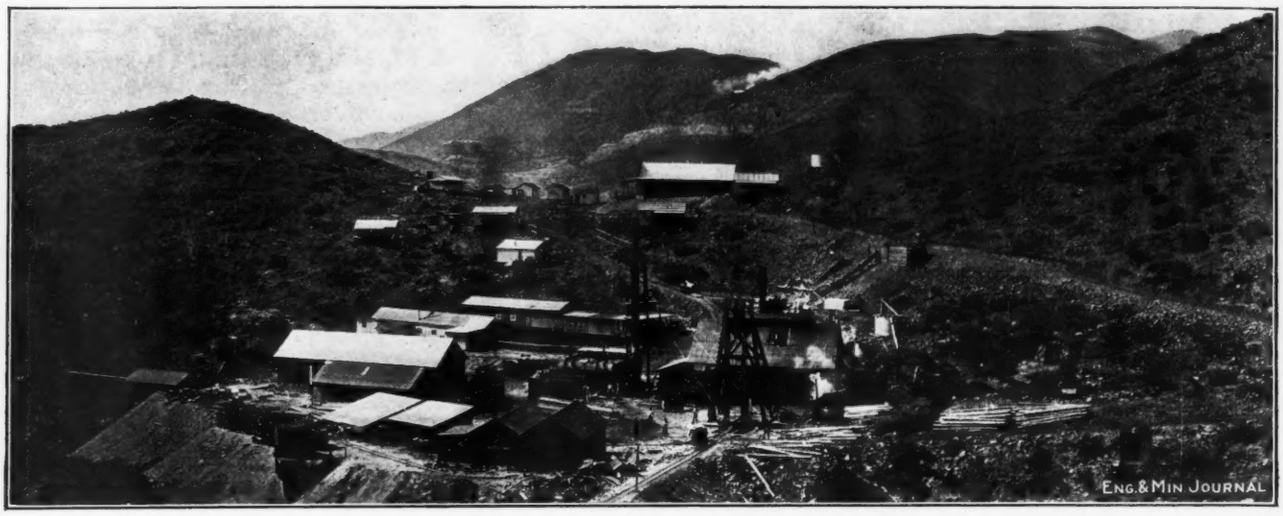
I have just read the "Historical Note on Smelting Lead and Silver," which appears in the JOURNAL of July 26, 1913, and which is apparently a reprint of a footnote from Hoover's translation of Agricola. With regard to the reference to Laurium, having some personal knowledge of the place and its conditions, I should like to correct the idea that any considerable proportion of the enormous production of silver turned out from that district from the days of the Trojan war up to near the Christian era was produced from argentiferous galena. As in the well known case of Leadville, and in others, the bulk of the surface ores which occurred in large irregular deposits in certain zones of the limestone were "carbonates," and it is undoubtedly these carbonate ores that were treated in such large quantities that the accumulations of ancient slags retreated in the smelting plants of the French and Greek Laurium companies amount to many hundreds of thousands of tons. Until up to some nine years ago, while certain proportions of galena concentrates were treated in the furnaces of the French Laurium Co., the bulk of the charge still consisted of carbonates, and it is only since that time that sulphide concentrates have predominated. The same would probably hold good as regards a majority of the ancient sources of silver and lead ores, which would, no doubt, be "carbonates" like those of Leadville, Broken Hill and Mexico.

No doubt, too, those were carbonate copper ores which, smelted direct to metal, as proved by the "prills" in the enormous slag heap which I have seen close to the ruins of his castle-palace, yielded funds sufficient to enable Achilles, poverty-stricken prince, as he was compared with some of the others, to join the brilliant throng of invaders of Troy.

HENRY F. COLLINS.

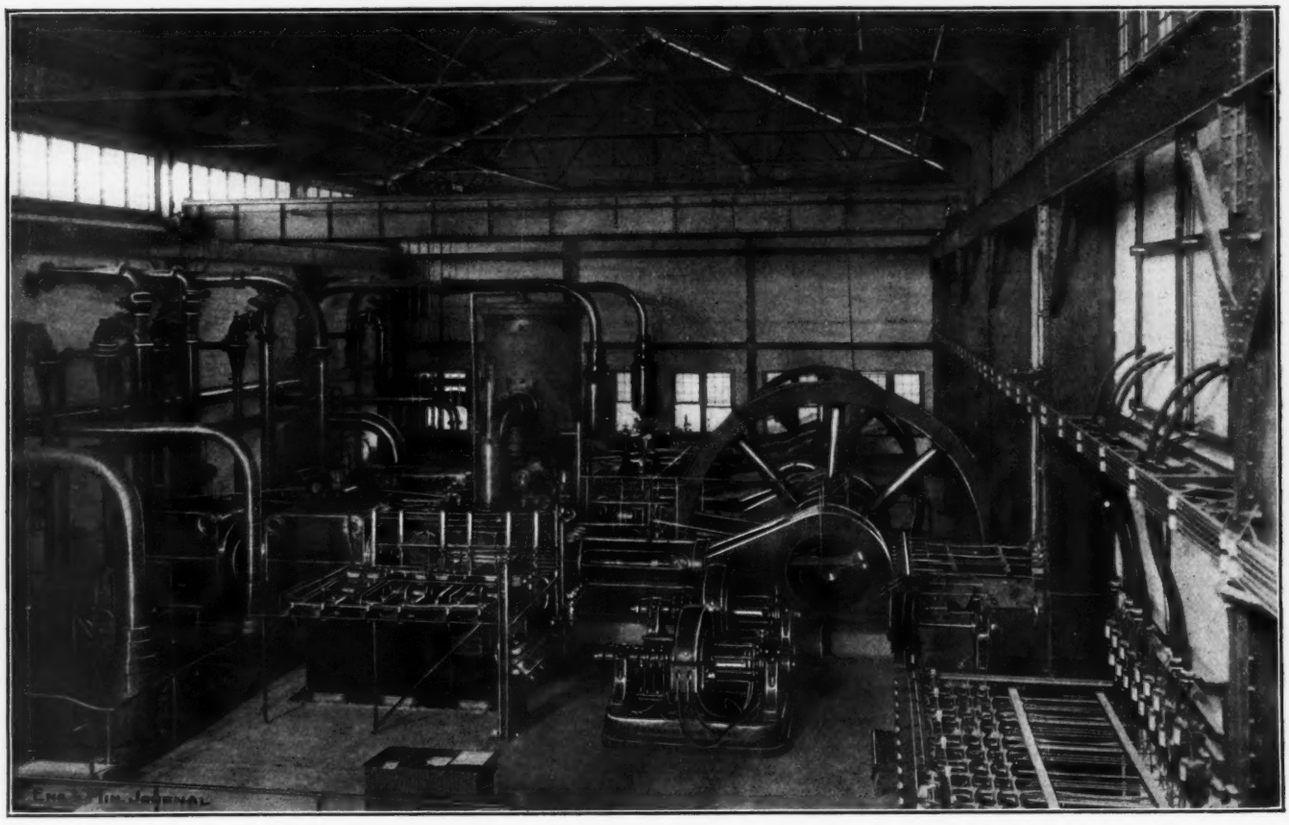
Valdelamusa, Huelva, Spain, Aug. 12, 1913.

PHOTOGRAPHS FROM THE FIELD



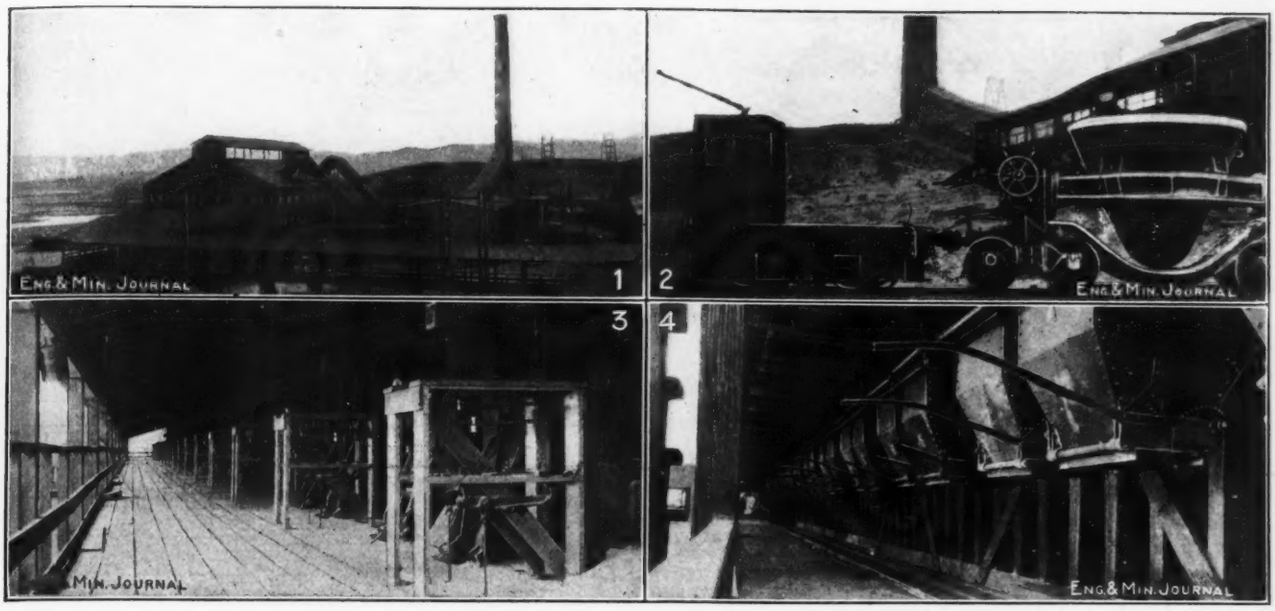
MINE OF THE ARKANSAS & ARIZONA COPPER CO., JEROME, ARIZ.

(The shaft is 1100 ft. deep, and is being raised from the 1400-ft. level. United Verde plant is on flank of hill well above the headframe in the center of the view.)



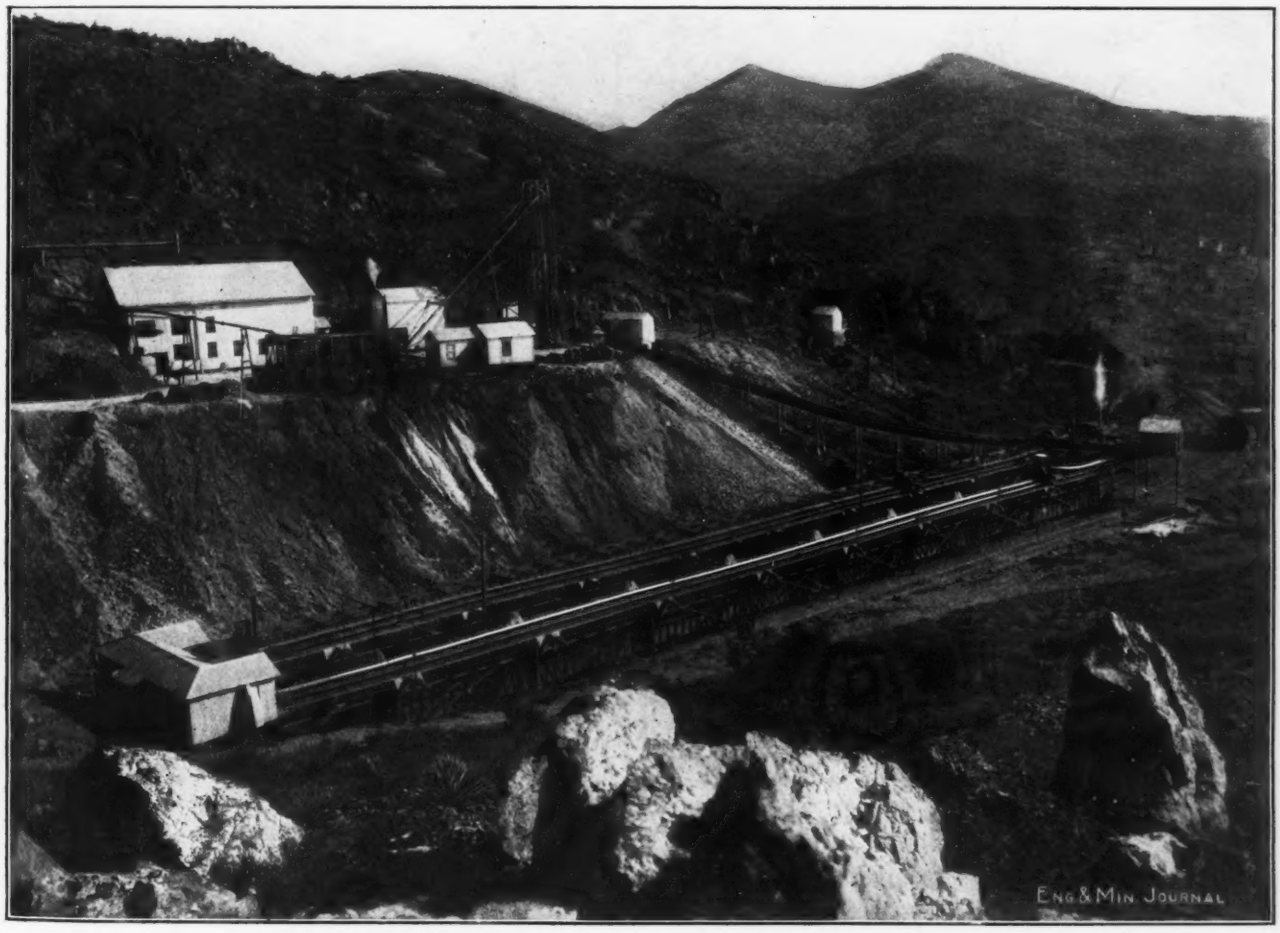
COPPER QUEEN MAIN POWER HOUSE COMPRESSORS, AT BISBEE, ARIZ.

(Capacity of the two Ingersoll-Rand and two Nordberg compressors is 21,000 cu.ft. of free air per min. at 90 to 95 lb. pressure.)



MASON VALLEY SMELTER AT THOMPSON, NEV.

(1, furnace building. 2, slag pot and motor. 3, weighing floor at stock bins. 4, weighing hoppers on floor below floor shown in 3.)



COPPER QUEEN SACRAMENTO SHAFT, BISBEE, ARIZ.

(Most of the Copper Queen ore is hoisted through this shaft in 3½-ton skips and taken by belt conveyor to the loading plant in foreground. The variety of ores made uniform bedding difficult, so now two belt conveyors load trains of seven railroad cars. At each journey the belt tripper passes over an eighth car dropping a sample of the lot. The plant is now under roof.)

THE MINING INDEX

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23,140—DRILLS—The Underground Blacksmith Shop. Ward Blackburn. (Comp. Air Mag., Aug., 1913; 4 pp., illus.) 20c.

23,141—GAS ENGINES—Practical Operation of Gas Engines Using Blast-Furnace Gas as Fuel. Charles C. Sampson. (Journ. A. S. M. E., Aug., 1913; 4 pp.) Discussion on paper previously indexed.

23,142—GAS ENGINES—The Working Fluid of Internal-Combustion Engines. Dugald Clerk. (Engineering, July 4 and 11, 1913; 9 pp., illus.) 60c.

23,144—GAS-FIRED BOILERS, Points on. K. Huessener. (Iron and Coal Tr. Rev., June 13, 1913; 1¾ pp., illus.) 40c.

23,145—GAS PRODUCER—Lignite Suction-Producer Troubles. George W. Muench. (Power, July 15, 1913; 1¾ pp.) 20c.

23,146—GASOLINE LOCOMOTIVE—The History of the Gasoline Mine Motor. R. O. Hodges. (Coal Age, July 19, 1913; 2½ pp., illus.) First instalment of paper read before W. Va. Coal Mine Inst., June, 1913. 20c.

23,147—GASOLINE MOTORS—Solutions of Two Gasoline-Motor Problems. R. O. Hodges. (Coal Age, July 26, 1913; 1¾ pp.) Second instalment of article indexed above.

23,148—HOISTS—Efficiencies of Two Rand Electric Hoists. J. N. Bulkley. (Eng. and Min. Journ., Aug. 2, 1913; 1 p., illus.) 20c.

23,149—OIL ENGINES—The Cost of Generating Power with Diesel Oil Engines. Gordon Kribs. (Can. Engr., July 10, 1913; 2¼ pp.) Statistics from plants operated by Texas Power & Light Co. 20c.

23,150—OIL-FUEL BURNERS—Brenner und Düsen für Oelfeuerungen. Bruhn. (Feuerungstechnik, June 1, 1913; 2¾ pp., illus.) Burners and atomizers for oil fuel. 40c.

23,151—PUMP—A Large Gas-Pump Installation at Chingford Reservoir, England. (Min. and Sci. Press, June 28, 1913; 2½ pp., illus.) 20c.

23,152—RESCUE APPARATUS—Wiederbelebungsvorrichtungen für den Grubenrettungsdienst Breyhan. (Glückauf, Apr. 26 and May 3, 1913; 19¼ pp., illus.) Resuscitation appliances in mine-rescue service. 80c.

23,153—SAFETY LAMPS—Miners' Electric Safety-Lamps. (Trans. No. Eng. Inst. Min. and Mech. Engrs., Mar., 1913; 7½ pp., illus.)

23,154—STEAM TURBINES, with Special Reference to Mining Installations. (Iron and Coal Tr. Rev., May 16, 1913; 3 pp., illus.) Paper before Assn. of Min. Elec. Engrs. 40c.

23,155—TURNTABLE—Cheap and Satisfactory Turntable. L. O. Kellogg. (Eng. and Min. Journ., Aug. 9, 1913; ¾ p., illus.) 20c.

SAMPLING AND ASSAYING

23,156—ATOMIC WEIGHTS and a New Theory of Chemical Affinity. James Moir. (Journ. Chem., Met. and Min. Soc. of So. Afr., May, 1913; 5¼ pp.) 80c.

23,157—BRASS—Ueber Messinganalyse. Koch. (Chem.-Ztg., July 22, 1913; 2 pp.) On the analysis of brass. 20c.

23,158—FLUE-GAS ANALYSIS—Making a Flue-Gas Analysis. (Power, June 17, 24, July 1, 8 and 15, 1913; 7 pp., illus.) $1.

23,159—GAS ANALYSIS—Apparatus for Gas-Analysis Laboratories at Coal Mines. George A. Burrell and Frank M. Seibert. (U. S. Bureau of Mines, Tech. Paper 14, 1913; 24 pp., illus.)

23,160—MINE SAMPLES—Notes on the Assay of Mine Samples. Robert Dures. (Journ. Chem., Met. and Min. Soc. of So. Afr., June, 1913; 3½ pp.) 60c.

23,161—POTASSIUM—Ueber den Nachweis des Kaliums mit Weinsäure. Reckleben. (Zeit f. angew. Chem., June 20, 1913; ½ p.) On the detection of potassium by tartaric acid.

INDUSTRIAL CHEMISTRY

23,162—AMMONIA—Die Vorzüge des direkten Ammoniak-Gewinnungsverfahrens gegenüber dem alten indirekten Verfahren. C. Heck. (Stahl u. Eisen, May 8 and 15, 1913; 10½ pp., illus.)

23,163—AMMONIA STILLS in By-Product Coke-Oven Plant. A. Thau. (Iron and Coal Tr. Rev., July 4 and 11, 1913; 5 pp., illus.) Translated from "Glückauf." 80c.

23,164—ATMOSPHERIC NITROGEN—Le Rôle des Basses Temperatures dans l'Industrie de la Fixation de l'Azote. Georges Claude. (Bull. Soc. Ing. Civ. de France, May, 1913; 17¼ pp., illus.)

23,165—BOILER SCALE—New Light on the Chemistry of Boiler-Scale Prevention. Edgar T. Wherry and George S. Chiles. (Eng. Mag., July, 1913; 7½ pp., illus.) 40c.

23,166—COKE-OVEN BY-PRODUCTS in 1912. Report under the Alkali Works Act. (Colliery Guardian, July 25, 1913; 1½ pp.) 40c.

23,167—COKE-OVEN GASES—Das Verfahren von Still zur direkten Gewinnung des Teers und Ammoniaks aus Koksofengasen. Korten. (Glückauf, July 12, 1913; 4 pp., illus.) Still's method of direct recovery of tar and ammonia from coke-oven gases. 40c.

23,168—COKE PLANT—Semet-Solvay Coke Plant at Cleveland. T. E. Pierce. (Coal Age, June 7, 1913; 2 pp., illus.) 20c.

23,169—LIME STORAGE—Storing Lime for Water Softening. Charles P. Hoover and C. J. Clarke. (Eng. Rec., July 5, 1913; 2⅛ pp., illus.) 20c.

23,170—NITRIC ACID—The Ostwald Process for Making Nitric Acid from Ammonia; Its Proposed Combination with the Manufacture of Calcium Cyanamide. (Met. and Chem. Eng., Aug., 1913; 3½ pp., illus.) 40c.

MATERIALS OF CONSTRUCTION

23,171—CEMENT—The Manufacture of Cement. E. Davidson. (Journ. So. Afr. Inst. of Engrs., May, 1913; 4 pp.) 60c.

23,172—CEMENT—The Rapid Growth of the Portland Cement Industry. J. M. Hartgering. (Pahasapa Quart., June, 1913; 3 pp.)

23,173—CEMENT INDUSTRY in the United States in 1912. Ernest F. Burchard. (Advance Chapter from Mineral Resources of the U. S., 1912; 24 pp.)

23,174—CEMENT MORTARS—Experiments on the Action of Various Substances on Cement Mortars. R. K. Meade. (Eng. Rec., July 5, 1913; 1⅝ pp.) Paper before Am. Soc. for Testing Materials. 20c.

23,175—CEMENT PLANT—The Metaline Plant of the Inland Portland Cement Co., Metaline Falls, Wash. Milo W. Krejci. (Bull. A. I. M. E., July, 1913; 10 pp., illus.) 40c.

23,176—CEMENT TESTING—The Autoclave Test for Cement. (Eng. Rec., July 5, 1913; 1½ pp.) Discussion by H. J. Force, R. J. Wig, L. R. Ferguson and H. S. Spackman before Am. Soc. for Testing Materials. 20c.

23,177—CONCRETE—Beton als Baustoff für Dampfkesseleinmaurerungen und Schornsteine. H. Winkelmann. (Glückauf, May 31, 1913; 1¼ pp.) Concrete as building material for steam-boiler settings and smokestacks. 40c.

23,178—PORTLAND CEMENT—Depreciation and Obsolescence in Portland Cement Plants. H. Struckmann. (Journ. A. S. M. E., Feb., 1913; 14 pp.)

23,179—PORTLAND CEMENT—Proposal for Establishing a Standard SO_3 Content for Portland Cement. (Chem. Engr., July, 1913; 3 pp.) Paper before Internat. Assn. for Testing Materials. 40c.

23,180—TESTING MACHINE—Die 1000 t- Materialprüfmaschine. Bauart Emery, des Bureau of Standards in Washington. Kurrein. (Zeit. d. Vereines Deutsch. Ing., July 19, 1913; 7 pp., illus.) The Emery 1000-ton materials testing machine of the Bureau of Standards, Washington, D. C.

MISCELLANEOUS

23,181—ALTITUDE EFFECTS—Blood-Pressure Variations as Influenced by Rapid Changes in Altitude. A Study of 100 Normal Men Employed at Homestake Mine. F. E. Clough. (Reprinted from the Archives of Internal Medicine, June, 1913; 3 pp.)

23,182—BOLIVIA—Railroads and Transportation Problems in Bolivia. G. W. Wepfer. (Min. and Sci. Press., July 19, 1913; 2½ pp., illus.) 20c.

23,183—BRICK CHIMNEYS—The Stability of Brick Chimneys. Harold Cane. (Iron and Coal Tr. Rev., May 16, 1913; 1 p., illus.) 40c.

23,184—CHINA—Travel in Central China. E. C. Thurston. (Min. Mag., June, 1913; 5½ pp., illus.) A mining engineer's journeys in Hupeh and Hunan. 40c.

23,185—FLOW OF WATER—A Mechanism for Metering and Recording the Flow of Fluids Through Venturi Tubes, Orifices or Conduits by Integrating the Velocity Head. J. W. Ledoux. (Proc. A. S. C. E., May, 1913; 20 pp., illus.)

23,186—FLOW OF WATER in Pipes. W. L. Durand. (Power, July 1, 1913; 1 p., illus.) 20c.

23,187—FOREST SERVICE INVESTIGATIONS. Review of. Vol. I. (U. S. Dept. of Agriculture, Forest Service, Mar. 11, 1913; 68 pp., illus.)

23,188—FORESTS and Their Effect on Climate, Water Supply and Soil. J. C. Stevens. (Assn. of Eng. Socs., July, 1913; 45 pp., illus.)

23,189—MAPS—Topographic Maps for the Mining Engineer. E. G. Woodruff. (Bull. A. I. M. E., June, 1913; 10 pp., illus.)

EDITORIALS

Ore Transportation

One of the gravest problems of the small mining district is the matter of transportation of its ore from the shaft houses to the railway. In the case of the great mines the first thing to be done preparatory to ore extraction is to run in a railway line. If the orebody be big enough the railway line may attain extensive proportions. Thus, no great stir was made about building a railway 165 miles long to serve the Nevada Consolidated Copper Co., at Ely, Nev. The Otavi Copper Co. built a line of several hundred miles in Africa, and Robert Williams is still engaged on the Benguela railway, a transcontinental line which is primarily intended to bring out the Katanga copper.

But what of the mine or mining district that cannot afford, or justify, the capital outlay for a railway, broad-gage or narrow-gage, or even of a wire ropeway? Such mines and mining districts are in the main dependent upon the archaic ore-wagon drawn by a team of two or four horses. This is costly, not because the teamsters are exorbitant, but simply because the method is inefficient and wasteful. Consider the changes in our western mining towns, e.g., Goldfield, when consolidations have led to the extension of railway spurs to the ore houses and the elimination of the teams and teamsters. The camp never afterward looks so active and bustling, to be sure, but the mines pay bigger dividends.

In the Rocky Mountain mining regions the transportation of ore by wagon seldom costs less than 15c. per ton mile, and frequently costs as much as 30c. The railway takes it to the smelter for something like 1c. per ton mile. Thus it is likely to cost as much to carry a ton of ore 10 miles to the railway station as it does to carry it thence 250 miles to the smelter. The average charge of the smelter, including his smelting cost, freight on the products to the Eastern refineries, refining cost, and profit, is probably about $9@10 per ton. The transportation costs from the mine to the smeltery are likely to be $5 for the distances mentioned above. These figures are not cited as an example of any particular case, but merely as an illustration of the general lay of the land. It is by no means an unusual condition that transportation from mine to railway accounts for 20% of the total cost to which a ton of ore is subject from the time it leaves the mine.

How to reduce this relatively enormous cost is a problem that has for many years engaged serious attention and is well worth while even if no really satisfactory solution has yet been found. The simplest expedient is, of course, the improvement of the wagon roads, a subject that the JOURNAL used to emphasize 25 years ago. Undoubtedly most mining communities have been derelict in that respect, and have wasted great sums of money because of their dereliction. Whether a road is to be a highway for the old-fashioned team or the modern motor truck, a good road is economical. Appreciating this, the American company which operates successfully in Ecuador under the enlightened management of Mr. Mercer is now engaged in building a macadam road some 50 miles long, on which motor trucks will be used.

The conditions in many mining districts are severe and preclude the same general use of motor trucks that is obtaining in and around our Eastern cities. We have seen many roads in the gulches and along the mountain sides, over which wagons are arduously hauled, that we should not like to try to navigate with a motor truck. On the other hand, there are many upon which a motor truck might be successfully run after some improvement. Certain of the problems of this nature are graphically outlined in a letter that we received recently from Nevada, which follows:

> Transportation across sandy stretches of desert is always a problem. It is often impracticable to attempt road construction of a substantial nature on the score of cost. By the use of brush such as sage and grease wood a sandy stretch of road can be made passable for even heavy teams for a considerable time. This has been the method in use upon the road from Winnemucca to National and automobiles and heavy teams go over portions of the road which would be otherwise quite impassable. At Rochester a similar problem has given much trouble. For nine miles from the mines at Rochester to Limerick cañon the road is sufficiently good to enable teaming and motor trucking to be successfully used. From Limerick cañon the road crosses a sandy flat to Oreana, a distance of 4½ miles. Attempts to use a motor truck over this stretch were unsuccessful and teaming was slow and expensive.
>
> A. A. Codd is installing a narrow-gage railroad over this stretch and is planning to haul the ore from his lease at Rochester by team to Limerick cañon and then by train over this road to the Central Pacific at Oreana. By the use of second-hand rails and ties the cost has been kept within reasonable limits. The railroad is being constructed of 56-lb. rails fr 2½ miles and 35-lb. rails for two miles. The maximum grade is about 4%. Ten 5-ton steel ore cars and a gasoline locomotive made by the Hall-Scott Motor Co., of West Berkeley, Calif., will be the rolling stock. The gage is 36 in. The construction of the road will involve but a small cost as but little grading will be necessary. It is estimated that $2500 will cover the cost of construction. The complete cost of the 4½ miles of railroad is estimated as $15,000. It is planned to have the road in operation before the end of July.
>
> Two Knox-Martin tractors were installed and operated by the Codd Leasing Co. but their use has been discontinued. It was found that they could not cross the sandy stretch of road and the 7 to 8% grades leading up to Rochester proved too much for them. One machine was in repair about all of the time. With one machine three trips with a 10-ton load were made over the nine-mile stretch. High altitude and insufficient radiator capacity increased the difficulties with these machines. At present hauling by teams at $2½ per ton for the nine miles has been found to be less costly than motor-trucking.
>
> A recent article in "Engineering News" (May 29) is of interest in this connection. At Blythe, Calif., teaming and motor trucking is accomplished over sandy stretches by constructing a board track. Such a track has been constructed for $1500 per mile and it is said to be satisfactory and serviceable. In order of cost, the cheapest first, are the brush-covered road, the board track and the narrow-gage railroad.

This letter illustrates very clearly how some of the Nevada miners are undertaking to solve their transportation problem. The plank track for a motor truck, to which our correspondent refers, was an ingenious and interesting expedient. Something of that kind might no doubt be adopted advantageously at bad places of dirt roads, even if the whole road were not to be laid

with plank, which, of course, would not be done if it were unnecessary.

The subject of light railways is one that probably has been neglected. There are no doubt many places where they might be advantageously laid, in view of their relatively low first cost, just as is being done at Rochester, Nev. The advent of the gasoline locomotive furnishes a new and convenient motive power for such lines.

The Society and the Institute

The proposed union of the Mining and Metallurgical Society of America and the American Institute of Mining Engineers has finally fallen through by adverse action of the directors of the Institute. This will surprise many members who thought that the plan was agreed upon and was all but consummated. The history of the matter is as follows:

Last fall the council of the Institute asked the council of the Society if it would appoint a committee to meet a committee of the Institute to consider a union of the two organizations. The council of the Society replied that it would instruct its executive committee to meet the Institute committee for that purpose.

The joint committee (consisting of James Douglas, A. R. Ledoux, J. F. Kemp, C. F. Rand, W. L. Saunders, for the Institute, and H. M. Chance, J. Parke Channing, J. R. Finlay, H. S. Munroe, and W. R. Ingalls, for the Society) held several sessions and finally agreed unanimously upon a plan of union, which was reported to the respective councils

In January last, the Society was informed that the council of the Institute had approved the plan. It was then approved by the council of the Society and the Institute was so notified.

Shortly afterward an active opposition developed among members of the Society, and the officers of the latter were advised by the officers of the Institute that they would await determination of the wish of the members of the Society. In due course of time, the Society held a referendum vote, which was favorable and the Institute was so notified, last May.

There were no other formal communications until this month, but in the meanwhile the Society was informed that the directors of the Institute had approved the plan with the proviso of a referendum vote among its members, and it is understood that there has been a good deal of informal discussion of the matter.

It is obvious that the Society was not kept properly informed respecting the situation in the Institute and was allowed to take a committing action, which it would not otherwise have done, or that the Institute repudiated previous action by itself at a time so late that the faith of the organization may be seriously impugned. Some harsh expressions respecting this have been uttered, even to the extent of charges that the Institute has acted intentionally in order to hurt the Society. We do not believe such to be the case, but fancy rather that the advocates of the union encountered opposition in the Institute which they could not manage. This, however, does not explain the failure to communicate promptly with the Society and give the latter an opportunity to withdraw from the project, which, no doubt, it would have done.

The proposed plan had previously met with opposition in the Society. Curiously, the opposition that later developed in the Institute in certain quarters, identified with what has been referred to as the "Old Guard," was about the same, i.e., the opponents in each organization objecting to the same things. In formulating the plan the representatives of each organization made concessions and the plan itself was probably as fair as such a thing could be. Its final rejection by the Institute is probably due to the dislike of the Society that dates back to the organization of the latter. On the part of the Society the whole plan of union was based upon the acceptance of the principles of the Society by a large number of Institute members who had not previously joined it. In the absence of such accessions to itself the Society could not contract to do the things obligatory upon it by the proposed plan of union and would assuredly have withdrawn from the project if it had had the opportunity.

The outcome of the matter leaves things as they were, plus some hard feelings. The Institute owes its reorganization to the influence of the progressive element, which formed the Society, and since its reorganization it has adopted many of the methods and practices of the Society. This has led to the remark that the Institute has stolen the Society's thunder to such an extent that the Society is superfluous. That expresses, however, a narrow and incorrect view.

The Society stands for principles and for the performance of functions which the Institute does not and can not. The Society is a strictly professional organization, which the Institute is not. The Society aims also to voice the opinion of the profession in matters of professional concern and in matters affecting the industry with which its profession is associated. The Institute cannot, either constitutionally or practically, much exceed its function of being a disseminator of knowledge. The last is, indeed, a service whereof the value is not to be underestimated, but it was precisely the recognition of that value that led the members of the Society, who with but few exceptions, are also members of the Institute, to consider union of the two organizations, which would abolish division of interest and add to the Institute an activity that would be useful to it. This is exemplified by the matter of discussions, which the Institute is eager to have but does not get. The Society has no such difficulty. In short, the Society has elements of human interest which the Institute has not.

As matters now stand, there will probably be a more pronounced division of allegiance than there has been in the past. The demands of organizations upon the attention of persons interested in mining and metallurgy become increasingly onerous; also the demands upon the purse. The latter may be regarded calmly, inasmuch as both in the cases of the Society and the Institute the dues are so moderate that combined they are less than those of other leading societies, but with respect to the demands upon time the thing is different, and no doubt many a member will now choose what he likes the better.

Bessemer and Basic Pig

The growth of the steel production in this country in recent years has been entirely in openhearth steel, and chiefly in basic openhearth. An evidence of this is found in the fact that in the first half of the current year the production of basic pig was greater than that of bessemer iron. The use of the openhearth furnace has also the

advantage of providing a market for a large quantity of steel scrap; and it is owing to this use of scrap that the steel production last year considerably exceeded that of pig iron.

For many years bessemer pig iron has been the leader in production, and also the leader in the pig-iron market. With the present tendency it will not be long before basic iron will be the chief factor. Indeed the change is already being discussed.

⁂

Cyaniding on the Mother Lode

The California Mother Lode region, important as it has been in the world's mining history, is somewhat reluctant to accept the latest developments in metallurgy. Concentration and amalgamation early proved applicable to the ores, and concentration it is today, and amalgamation, just as in years gone by. Refinements of concentration came in, the canvas tailing-concentrating plant is one of them. Cyaniding was born, grew, at first slowly, then faster, until it spread over all the world, except the Mother Lode. The Mother Lode old-timers believe cyanidation will not recover the gold from their sulphide ores; they tried it—many years ago. But lately the process has been breaking into the last unoccupied stronghold. At the Black Oak mill the process has been successful. Will that success be sufficient argument to secure new trials at other mines on a modern basis? It seems likely that it will, and perhaps the Mother-Lode sulphides will soon give up more gold at less cost than ever before.

BY THE WAY

In a recent legal address concerning expert testimony, we note among those things which are certain: "The metallurgist *knows* that certain clays contain aluminum and that it will bubble forth under certain heat." Three cheers for that metallurgist. And by the way, just send us in some nonaluminous clays for our specimen cabinet.

⁂

The great meteorite which fell near Sasayama, Japan, in 1904 ("Memoirs," College of Science and Engineering, Kyoto University, 1912), has recently been analyzed. According to *Nature*, it runs: Fe, 94.85%; Ni, 4.44; Co, 0.48; Cu, tr; P, 0.23%. Thus, nickel-iron amounts to 98.71% and phosphor-nickel-iron to 1.29%. The composition is similar to the De Sotoville meteorite.

⁂

"Sand is any hard granular rock material finer than gravel and coarser than dust," says the Geological Survey. And what is gravel? Why, any hard granular rock material finer than cobble stones and coarser than sand, of course. And what is dust? Gross stupidity, any h. g. r. material finer than sand and coarser than zero. This comparative method of definition is rather attractive when one gets used to it. Give it a trial.

⁂

In the Annual Report for 1912 of the New South Wales Department of Mines, there is included a set of regulations to cover coal mining, promulgated by the Home Secretary of England. In one clause it is provided that "the firing cables shall not be coupled up to the fuse or detonator wires until the kettle, kibble, tub, bowk or hoppet is conveniently placed for the men in the shaft to enter." Even American metal miners probably know what a "tub" is, some have heard of "kibbles," and have some idea of a "kettle." But we hereby open a guessing contest as to what a "bowk" or "hoppet" may be. No entries from England will be accepted.

⁂

It happens in Queensland, according to the annual report of the Under Secretary for Mines, that in many cases the installation of means for promoting cleanliness finds the miners unappreciative. It is stated that the provision of basins in change rooms and in some cases shower baths did not result in their very extensive use and in one or two mines the basins were never used. It would seem that you can lead water to a miner but you cannot make him wash. It is a fact that for an operator to present the opportunity for safety, sanitation and cleanliness is not sufficient, whether in the mining field or any other. An effective campaign of improvement requires education of the improvees, if not actual coërcion. It is likely here, though, as in many American camps, that the men prefer to return to their homes, make a good job of it and sally forth on the street again attired in their best raiment.

⁂

According to a writer in the Los Angeles *Times*, who has been inundated with prospectuses of mining propositions, covering everything from iron to radium and Patagonia to the Pole, the first man he has found who dared lay down hard and fast rules for picking mining investments was Col. H. Engels. Colonel Engels owns a copper mine and smelting works up near Susanville, Calif. The plant is closed down because the government, in its more or less infinite wisdom, saw fit to surround the works, with a "forest reserve" just about the time that Colonel Engels had got things going to the satisfaction of his stockholders and himself. Every Western kid in kindergarten knows that every Eastern highbrow would prefer that half a gross of California miners should go hungry than that the scrubbiest scruboak should suffer potential detriment. Here follow Colonel Engels' infallible rules for telling a good mine: The ores must be of primary origin and in a primitive formation; the ores must be amenable to profitable concentration by other means than furnace smelting; the dividends should yield at least 10% on the purchase price of the stock; the blocked-out or proved ores should equal at least 60% of the value of the stock; the lowest levels and most recent developments of the mine must show increasing or sustained richness of ore. These are some rules. Colonel Engels doubtless understands them, for he formulated them and is a very intelligent man. The writer even catches a glimpse of their meaning, but, then, he has dabbled in copper mining for more than 20 years, off and on—usually off and semi-occasionally on. But how about the inexperienced investor. Why, to fit that poor innocent rightly to apply Colonel Engels' infallible rules, one would have to endow him with a four years' course in the mining college over at Berkeley and then apprentice him to a sorcerer. If there is any way of telling, short of necromancy, when a nondividend-paying mining stock is about to go permanently on a 10% dividend basis, the writer has never heard of it.

National Promotion of Mining Education

WASHINGTON CORRESPONDENCE

Members of Congress interested in mining matters are giving a good deal of serious attention and study to the so called Foster bill, introduced some time ago for the promotion of education on mining, and it is understood that some modified plan of this sort is likely to be acted upon by the committee on mines of the House, either at the current session or early next session. The Foster bill provides:

"That there shall be appropriated from the sale of public lands not otherwise appropriated, the sum of $5000 for the fiscal year beginning July 1, 1914; the sum of $10,000 for the fiscal year beginning July 1, 1915; the sum of $15,000 for the fiscal year beginning July 1, 1916; the sum of $20,000 for the fiscal year beginning July 1, 1917; the sum of $25,000 for the fiscal year beginning July 1, 1918, and $25,000 for each succeeding year thereafter, to each State and Territory in the United States, for the establishment and maintenance, under the control of the Secretary of the Interior of the United States, of a school or department of instruction in mines and mining.

Sec. 2. That if there be already established in any State or Territory a school of mines and mining under the control of said State or Territory, or a department of instruction in mining connected with any institution of learning controlled by said State or Territory, then the moneys appropriated in section one of this Act shall go to said school or department of instruction already established. That if there are two schools or departments of mines and mining in any State or Territory under the control of said State or Territory, then the money so appropriated shall be equally divided between such schools or departments.

Sections three and four go on to prescribe the type of instruction to be given in the schools and the kind of reports to be made. Section 5 requires:

That if at any time in the judgment of the Secretary of the Interior any school or department of instruction in mines and mining provided for in this Act shall not be faithfully carrying out the purposes of said Act as set forth in section three hereof, then all moneys herein appropriated for said school or department of instruction shall be withdrawn from said school or department of instruction until the same shall have produced evidence satisfactory to the Secretary of the Interior that said school or department of instruction is faithfully carrying out the provisions of section three of this Act.

❋

Chronology of Mining for August, 1913

Aug. 1—Strike of workmen on the ore docks at Superior, Wis.—Lundberg, Dorr & Wilson mill, at Terry, in the Black Hills, S. D., closed down.—First gold shipped from Shushanna district, in Alaska.

Aug. 2—Eighteen men killed in the East Brookside mine, of the Philadelphia & Reading Coal & Iron Co., near Tower City, Penn.

Aug. 5—Lead miners of St. Francois County, Missouri, vote to strike for increased wages, and recognition of the Western Federation of Miners.

Aug. 14—Troops called out to quell rioting at Nanaimo, Ladysmith, and Extension, Vancouver Island, British Columbia.—Electrical workers at Butte, Mont., strike for higher wages.—Foreigners on the charge floor of the blast furnaces of the United States Smelting, Refining & Mining Co., at Midvale, Utah, strike for an increase in pay.

Aug. 16—Strike of miners in St. Francois County, Missouri, begun.

Aug. 20—Quartette mill, at Searchlight, Nev., destroyed by fire.

Aug. 22—Fifty miners killed by dropping of cage in a mine in the Mysore district, India.

Aug. 26—Lead miners in St. Francois County, Missouri, return to work—Judgment rendered in favor of New Keystone company, in Inspiration Consolidated vs. New Keystone suit, over right-of-way question of a connecting drift.

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August Mining Dividends

Dividends paid for the month of August by United States mining companies making public reports, amounted to $2,089,605, those of iron-smelting, industrial and holding companies to $9,688,419; and those of Canadian and Mexican mining companies to $1,163,324. Mohawk reduced its dividend from $3 to $2, which was about the only change of note, the usual August leanness characterizing the last. Last year's August statement was $1,643,544; $11,062,887; and $763,441; corresponding respectively to the previously mentioned figures.

Canadian, Mexican and Central American Companies	Situation	Per Share	Total
Amparo, g. s.	Mex.	0.04	80,000
Buffalo, s.	Ont.	0.03	30,000
Butters-Salvador, g. s.	C. A.	0.36	96,750
Chontalpan, g. s. l. z.	Mex.	0.50	3,500
Cobalt Lake (holding company)	Ont.	0.24	72,900
Cobalt Townsite, s.	Ont.	0.24	120,000
Coniagas, s.	Ont.	0.45	360,000
Crown Reserve, s.	Ont.	0.05	88,441
Hollinger, g.	Ont.	0.15	90,000
Lucky Tiger, g.	Mex.	0.05	35,767
Seneca-Superior, s.	Ont.	0.10	47,683
Steel Co. of Canada	Can.	1.75	113,750
Temiskaming & Hudson Bay, s.	Ont.	3.00	23,283
Victoria, s. l. g.	Mex.	0.50	1,250
Iron, Industrial and Holding Companies	**Situation**	**Per Share**	**Total**
Amalgamated, c.	U. S.	1.50	2,308,319
Cambria	U. S.	0.62½	562,500
International Nickel, pfd.	U. S.	1.50	133,890
International Smelting	U. S.	2.00	200,006
National Carbon, pfd.	U. S.	1.75	78,785
St. Mary's Mineral Land	Mich.	1.00	100,000
U. S. Steel, pfd.	U. S.	1.75	6,304,919
United States Mining Companies	**Situation**	**Per Share**	**Total**
Alaska Mexican, g.	Alas.	0.30	54,000
Alaska Treadwell, g.	Alas.	1.00	200,000
Alaska United, g.	Alas.	0.50	90,100
Bunker Hill & Sull., s. l. g.	Ida.	0.20	65,400
Bunker Hill Con. g.	Calif.	0.05	10,000
Chief Con., l. s.	Utah	01.0	87,138
Camp Bird, g. s.	Colo.	0.24	267,300
Colo. Gold Dredging, g.	Colo.	0.25	25,000
Elkton, g.	Colo.	0.02	50,000
Fremont, g.	Calif.	0.02	4,000
Frontier, z.	Wisc.	2.00	2,500
Golden Cycle, g.	Colo.	0.02	30,000
Hazel, g.	Calif.	0.01	9,000
Hecla, l. s.	Ida.	0.02	20,000
Homestake, g.	S. D.	0.65	163,254
Miami, c.	Ariz.	0.50	372,202
Mohawk, c.	Mich.	2.00	200,000
Parrot, s. c.	Mont.	0.15	34,477
Portland, g.	Colo.	0.02	60,000
Round Mountain, g.	Nev.	0.04	34,961
Tom Reed, g.	Ariz.	0.06	54,373
United Verde, c.	Ariz.	0.75	225,000
Wasp No. 2, g.	S. D.	0.01	5,000
Yellow Aster, g.	Calif.	0.05	5,000
Yellow Pine, z. l. s.	Nev.	0.02	19,000
Yosemite Dredging, g.	Calif.	0.10	2,400

Dividends paid by United States mining companies for the first eight months of the year are $47,540,327; iron-smelting, industrial and holding companies, $73,771,844; and by other North American companies, $15,042,619. The figure for the same period of last year for United States mining companies is $36,226,119.

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Silver Consumption in the Fine Arts in the United States amounts to about 50,000,000 oz., according to "Marquette Mining Journal," July 11, 1913. Probably the largest individual consumer is the Handy & Harman factory, at Bridgeport, Conn., where the metal is prepared for conversion into silverware. It is estimated that this plant uses 10,000,000 oz. annually. The Eastman Kodak Co. is said to use about 3,000,000 oz. yearly in photographic supplies.

PERSONALS

J. Parke Channing has returned to Miami.

W. F. Lamoreaux has returned to Ducktown, Tennessee.

James Lindsay is making examinations in the Superior district.

Edwin J. Fowler, metallurgist of the Pacific Foundry Co., is in Denver.

E. M. Hamilton has gone to Salvador, where he expects to remain for several months.

Kirby Thomas has returned from examination of the iron deposits at Guernsey, Wyoming.

H. N. Cox, formerly assistant master mechanic at the Four C's mine in Cananea is in Miami.

John L. Malm, of the Malm-Wolf Co., Denver, Colo., is in Chicago on professional business.

Bailey Willis, Chester Washbourne, and J. R. Pemberton have returned from Argentina.

John Dern has returned to Salt Lake City after spending five months in Germany and Austria.

J. A. Flemming, operating the old Irene property near Globe, has returned from a trip to the northern part of the state.

Thomas M. McGill, of Chicago, who is interested in the United Gold Mines Co. visited the property near Congress recently.

Frank Collins was in Phoenix recently having come from Durango, Mexico, with other refugees who came out via Mazatlan.

Robert Linton, who has been examining properties in Lander County, Nev., has completed his work and returned to Los Angeles, Calif.

A. Kauffmann, formerly assistant to the president of the Link-Belt Co., has been made general manager of the company's works at Nicetown, Philadelphia.

C. S. Davis, formerly with the Juragua Iron Co., of Cuba, has accepted a position with W. R. Grace & Co., as mining engineer. His new address will be Iquique, Chile.

Henry C. Carlisle, formerly of Tonopah, Nev., has gone to Bolivia on mine examination work. His address will be care American Embassy, La Paz, Bolivia.

Alfred Martin, of Virginia, Minn., has been appointed general superintendent of the M. A. Hanna & Co. interests in the Crystal Falls-Iron River District, Mich. Formerly he was with same company at Virginia, Minn.

F. Danvers Power, of Sydney, N. S. W., who was in charge of the Great Cobar during the absence of H. C. Bellinger, is to take an extended tour, embracing Java, the Malay Peninsula, Japan, the United States, and London.

Francis P. Bray has completed a visit of inspection to Mount Lyell, Broken Hill, and other mining centers in Australia, and has left for London by way of Manila, China, Japan and across the Trans-Siberian railway.

L. G. Huntley, of the Associated Geological Engineers has returned to the Pittsburgh office after an absence of two months spent in geological examinations in the Athabasca River country in northern Alberta, Canada.

L. P. Alford, editor of the "American Machinist" returned to New York last week from a trip to Europe where he attended the joint meeting of the American Society of Mechanical Engineers and the Verein Deutscher Ingenieure.

Professor Solon Shedd of the Department of Geology of the Washington State College, is in Baker County, Oregon, looking over the situation preparatory to making a topographic map of the state for the Oregon Bureau of Mines and Geology.

Prof. A. P. Coleman, of Toronto University, who was one of the party of geologists who left for a trip through Western Canada at the close of the International Geological Congress, broke his leg while descending a mountain at Field, B. C.

Alexander Gillies, Sam. Otisse and other prospectors, who left Toronto three months ago to investigate a large area of territory in Northern Quebec, have returned after a circular tour covering 1500 miles, without having made any discoveries.

Harold C. E. Spence has returned from abroad, and with John E. Marshall Hall, of London has been examining the oil-shale areas of Newfoundland and Nova Scotia on behalf of the Royal Commission on Fuel Oil and Engines, appointed by the British Government.

F. E. Schmitt of "Engineering News" returned to New York last week after a trip to Europe visiting the following countries, Germany, Austria, Switzerland, Belgium, France and England. While in Germany he attended the meeting of the Verein Deutscher Ingenieure.

R. N. Dickman has removed his office from the Rookery Building to the Mallers Building, South Wabash Ave., Chicago, and has consolidated his laboratory with that of Thomas J. Dee & Co., under the direction of James Kilgallon, who has been chemist with Mr. Dickman for 20 years.

Professor Lewis E. Young, who for the past six years, has been director of the Missouri School of Mines, will in September take up graduate work in the Department of Economics at the University of Illinois, and will also give part of his time to teaching in the Department of Mining Engineering.

Elmer A. Holbrook, professor of Mining Engineering in the Nova Scotia Technical College, Halifax, N. S., has been appointed assistant professor of Mining Engineering at the University of Illinois to have charge of the recently equipped coal-washing and ore-dressing laboratory and the course in mine design.

Fred R. Low, editor of "Power" returned to New York on Aug. 29, from an extended trip in Europe, where he was a member of the official party of the American Society of Mechanical Engineers who attended the joint meeting with the German national engineering society, the Verein Deutscher Ingenieure.

OBITUARY

Liberty E. Holden, owner of the Cleveland "Plain Dealer" died near Mentor, Ohio, on Tuesday, Aug. 26. He was born June 20, 1833, in Raymond, Me., and graduated from the University of Michigan in 1858. He was married in Kalamazoo, Mich. Later he became superintendent of schools in Tiffin, O., and was admitted to the bar. He came to Cleveland in 1866, and in 1872 was made manager of the Pittsburgh & Lake Angeline mines, while two years later he became interested in silver mines in Utah, which engaged his attention for almost 20 years.

Charles A. Canfield died suddenly at Los Angeles, Calif., Aug. 16, aged 65 years. It was largely through his pioneering work in conjunction with E. L. Doheny, that the fuel oil industry of California received impetus. They were jointly the discoverers of the Los Angeles City oilfield in 1892. The Coalinga oilfield is also credited to C. A. Canfield as discoverer, when he drilled the first oil well in the district under extremely trying conditions. Mr. Canfield, in conjunction with J. A. Chanslor, was also one of the pioneers in the Midway district, these two having formed what is now known as the Chanslor-Canfield Midway Oil Co., at present owned by the Santa Fé R.R. At the time of his death, Mr. Canfield was vice-president of the Mexican Petroleum Co., Ltd., and its proprietary companies; the American Petroleum Co., and the American Oilfields Co., both of which are now controlled by the California Petroleum Corporation. In addition, he had many independent oil interests, and was largely interested in industrial, banking and other enterprises in Southern California. He leaves a large fortune.

Carroll Dunham Galvin, 47 years old, killed himself in a hotel in Chicago, Aug. 13. Galvin had registered as Charles Dunham, of Pittsburgh. His home was in Oakland, Calif., where his wife and two children reside. Galvin was graduated from the Worcester, Mass., School of Technology, and began a practical, though at times erratic, career in the copper region of Shasta County, Calif., 15 years ago, when the Mammoth, the Balaklala and the Trinity copper mines were only prospects. He was associated with John Fillius and Frederick R. King, of Denver, and Frederick Grotefend, of Redding, in the prospecting, development and promotion of copper mines. He and Grotefend first attracted the attention of Fillius and King to the copper possibilities of Shasta County. Their first important work was the development and sale of the Trinity copper mine. Their last and most important operation was the sale of the Mammoth copper mine. Galvin was inclined to be visionary, but his visions were usually founded upon material mineral wealth until he separated from the men who had held him down to his possibilities, and he undertook to develop dredging ground in Trinity County. Having acquired some money, he tried also the promotion of rubber plantations in Mexico; but lost money. He then tried the promotion of an automobile tire. It is said that failure in this last venture and the loss of money in Mexican mines caused him to commit suicide.

SOCIETIES

American Electrochemical Society—The twenty-fourth general meeting will be held at Denver, Colo., Sept. 9, 10 and 11, 1913.

American Society of Civil Engineers—The first regular business meeting of the season of 1913-14 was held at the Society House, Wednesday, Sept. 3. Two papers were presented for discussion: "The Storage of Flood-Waters for Irrigation: A Study of the Supply Available from Southern California Streams," by A. M. Strong, Assoc. M. Am. Soc. C. E.; and "Modern Pier Construction in New York Harbor," by Charles W. Staniford, M. Am. Soc. C. E.

INDUSTRIAL NEWS

The San Francisco office of the Goldschmidt Thermit Co. has been removed from Nos. 432-436 Folsom St. to 329-333 Folsom St., San Francisco.

George Best, President of Best Manufacturing Co. for 12 years, has severed his connection with that company and with his son, George H. Best, M. E., has organized the Best Pipe Engineering & Supply Co., with offices at No. 3026 Liberty Ave., Pittsburgh, Penn.

The Keystone Driller Co. Beaver Falls, Penn., on Aug. 22 was awarded the contract for the largest size Downie double stroke pump for the city of Naperville, Ill. Capacity 350 gal. per minute; 300 ft. head. Pump to be direct connected to motor.

The Pierce-Arrow Motor Car Co. announces the introduction of a new 2-ton motor truck, built on the general lines of its well known successful 5-ton truck. The machine is worm-driven by a 4-cylinder 25.6 horsepower motor, S. A. E. rating. The transmission permits three speeds forward and one reverse, the maximum forward speed being 16 miles per hr. Ignition is obtained with a Bosch magneto system. The total admissible load on the chassis is 5200 lb., this including both the body and the paying load. An effort has been made to minimize oiling and greasing trouble so far as possible by eliminating grease cups and substituting a special type of self-lubricating bearing. The bearings are ball and roller in all places except in the motor. The price of the truck is $3000 f.o.b. Buffalo, including the chassis with reasonably complete equipment, except for the body.

TRADE CATALOGS

Sprague Electric Works of General Electric Co., 527-531 West 34th St., New York. Bulletin No. 246. Motor-driven exhaust-fan outfits, direct and alternating current. Ill., 12 pp., 10½x8¼ in.

The Electric Storage Battery Co., Allegheny Ave. and 19th St., Philadelphia, Penn., Bulletin No. 141. The Exide Stand-By Battery. Illus. 20 pp. 8x10½ in.

Power & Mining Machinery Co., Cudahy, Wis. Bulletin No. 45. Machinery for wet ore concentration processes. Ill., 64 pp., 6x9 in.

This is a short treatise on the theory of concentration, with descriptions of standard apparatus as manufactured by the company.

National Tube Co., Pittsburgh, Penn., Booklet. The Whole "Kewanee" Family. Unions, union ells and tees, and coupling. Ill., 48 pp., 5½x8 in.

Northwestern Expanded Metal Co., Chicago, Ill. Expanded Metal Construction. September number of a monthly bulletin. Ill., 12 pp., 6x9 in.

Hardinge Conical Mill Co., New York. Catalog, No. 6. Ill., 20 pp., 6x9 in.

A new issue of the catalog of this company, giving description of its conical ball and pebble mills, together with some favorable opinions on this use and a note of some successful installations.

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 95c. each. British patents are supplied at 40c. each.

PROPS—Improvements in Collapsible Modern Mining Props. H. Heidkamp, Hamborn-Neumühle, Rheinland, Germany. (Brit. No. 17,557 of 1912.)

ROCK-BREAKING SHOVEL. Olin S. Proctor, New York, N. Y. 1,067,375; July 15, 1913.)

CONCENTRATION—Pneumatic Concentrating Table. Clarence Q. Payne, New York, N. Y. (U. S. Nos. 1,068,162 and 1,068,163; July 22, 1913).

MAGNETIC SEPARATOR. George Ullrich, Magdeburg, Germany. (U. S. No. 1,067,287; July 15, 1913.)

ELECTRIC FURNACES—Electrode Holder for Electric Furnaces. Dorsey A. Lyon and Edwin R. Cox, Jr., Heroult, Calif. (U. S. No. 1,068,148; July 22, 1913.)

ROASTING—Improvements in or Relating to Furnaces and Apparatus for Roasting Ores. Union des Produits Chimiques d'Hemixem, Brussels, Belgium. (Brit. No. 14,637 of 1912.)

ALLOY—Noncorrosive Metallic Alloy of Copper, Nickel, Zinc, Etc. John Coup, Marion, Ohio. (U. S. No. 1,069,113; Aug. 5, 1913.)

AMALGAMATOR. George H. Loucks, Chicago, Ill. (U. S. No. 1,070,048; Aug. 12, 1913.)

CONCENTRATING PAN. Louis Bowerman, Portland, Ore. (U. S. No. 1.070,107; Aug. 12, 1913.)

MANGANESE SULPHATE, Production of. A. G. French, Nelson, B. C. (Brit. No. 22,078 of 1912.)

TIN—Method and Apparatus for Electrolytically Recovering and Refining Tin. G. Michaud and E. Delasson, Seine, France. (Brit. No. 20,557 of 1912.)

ZINC—An Improved Method of and Apparatus for Roasting Zinc Blende. A. L. J. Queneau, Philadelphia, Penn. (Brit. No. 15,460 of 1912.)

ZINC—Metallurgical Apparatus for Condensing Metallic Vapors. Woolsey McA. Johnson, Hartford, Conn. (U. S. No. 1,069,260; Aug. 5, 1913.)

DETONATING DEVICE. Sidney John Hibon, New York, N. Y., assignor of one-half to Asher Kleinman, New York, N. Y. (U. S. No. 1,068,431; July 29, 1913.)

DRILLS—Chuck for Rock Drills. James C. H. Vaught, San Francisco, Calif. (U. S. No. 1,068,612; July 29, 1913.)

DRILLS—Fluid-Pressure-Operated Tool. William Prellwitz, Easton, Penn., assignor to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,069,289; Aug. 5, 1913.)

EXCAVATING—Dipper for Excavating Machines. Walter S. McKee, Clencoe, Ill., and Percival M. Vilas, Minneapolis, Minn., assignors to Edgar Allen American Manganese Steel Co., Augusta, Maine. (U. S. No. 1,069,889; Aug. 12, 1913.)

CONCENTRATION—Improvements in or Relating to Apparatus for Ore Concentration. J. Hebbard, Broken Hill, N. S. W., and Minerals Separation, Ltd., London, Eng. (Brit. No. 15,546 of 1912.)

COMBUSTION—Method of Producing a Retarded Combustion of a Gas Flame. Henry L. Doherty, New York, N. Y. (U. S. No. 1,069,867; Aug. 12, 1913.)

ELECTRIC FURNACE. Alois Helfenstein, Vienna, Austria-Hungary. (U. S. No. 1,069,252; Aug. 5, 1913.)

FURNACE GAS—Process of Treating Combustible Metallurgical-Furnace Gas to Increase Its Calorific Value. Henry L. Doherty, New York, N. Y. (U. S. No. 1,069,865; Aug. 12, 1913.)

GLASS FURNACE AND PROCESS. Paul L. T. Héroult, La Praz, France. (U. S. No. 1,069,255; Aug. 5, 1913.)

HYDROCARBON FURNACE. Miles Connor, Pueblo, Colo. (U. S. No. 1,069,230; Aug. 5, 1913.)

ROASTING—Process and Apparatus for Roasting ores and Recovering the Gases Therefrom. Felix von Schlippenbach, Stolberg, Germany. (U. S. No. 1,069,191; Aug. 5, 1913.)

COPPER-ORE TREATMENT—Method of Recovering Copper from Its Ores. Edward Schaaf, St. Marys, Mo., and Stephen G. Martin, Chicago, Ill., assignors of one-third to William O. Bartholomew, St. Louis, Mo. (U. S. No. 1,069,981; Aug. 12, 1913.)

GOLD SEPARATOR. John F. Kellogg, Guthrie, Okla. (U. S. No. 1,070,695; Aug. 19, 1913.)

BLAST FURNACES—Ejector for the Smoking Gases of Blast Furnaces and the Like. Ernst Ritter Schikich von Vellebit, Vienna, Austria-Hungary. (U. S. No. 1,071,596; Aug. 26, 1913.)

CORROSION—Treatment of Iron or Steel for Preventing Oxidation or Rusting. Frank R. G. Richards, Coventry, England. (U. S. No. 1,069,903; Aug. 12, 1913.)

INGOT MOLD. William R. Bossinger, Marion, Ohio. (U. S. No. 1,070,106; Aug. 12, 1913.)

REGENERATIVE FURNACE. Luther L. Knox, Avalon, Penn., assignor to the Knox Pressed & Welded Steel Co., Niles, Ohio. (U. S. No. 1,070,486; Aug. 19, 1913.)

STEEL TREATMENT—Process of Treating Melted Metals Alloys, and Steels for Removal of Gas. L. M. V. H. Baraduc-Muller, Paris, France. (U. S. No. 1,071,632; Aug. 26, 1913.)

SUBLIMED LEAD—Apparatus for Producing Sublimed Lead. Louis S. Hughes, Chicago, Ill. (U. S. No. 1,070,688; Aug. 19, 1913.)

THORIUM—Process of Obtaining Thorium. Morduch Koss, Oranienburg, near Berlin, Germany, assignor to Chemische Fabrik Germania Gesellschaft mit Geschrankter Haftung, Oranienburg, near Berlin, Germany. (U. S. No. 1,069,959; Aug. 12, 1913.)

EDITORIAL CORRESPONDENCE

SAN FRANCISCO—Aug. 28

Four New Laws Directly and Exclusively Affect the Mining Industry. Two others while not directed especially to the mining industry have a direct effect upon mining. These mining bills provide: (1) For the reconstruction of the state mining bureau; (2) for making oil pipe-lines common carriers; (3) for the investigation of injury done by waste from smelting plants; (4) for the establishment and maintenance of telephone systems in mines 500 ft. deep. The two laws which affect the mining industry and are not classed as mining bills provide: (1) For the regulation of the use of water and the creation of a state water commission; (2) for workmens' compensation and the establishment of a state compensation insurance fund. The act known as the "blue sky" law will also affect the mining industry so far as the mining-investment companies are concerned. This law vests in the commissioner of corporations sole authority to regulate and sanction any investment company. The law amending the corporation license tax law is another that affects the mining industry. This law provides for the reinstatement of corporations which forfeited their charters for nonpayment of the license tax. It is probable that the workmen's compensation law and the law for reinstatement of corporations will be met by a demand for a referendum. The law providing for the establishment and maintenance of telephone systems in mines is one that is necessary for the mining companies which heretofore have been dilatory in providing underground communication. It is considered by proponents of the law reconstructing the state mining bureau that the section granting to the state mineralogist or his qualified assistant the right to examine mines will enable him to make investigations in case of accidents or irregular or unlawful operation of mines. But this matter is wholly covered by the workmen's compensation law and there is nothing in the law reconstructing the state mining bureau which gives to the state mineralogist any power or authority to investigate accidents or the improper or unlawful operation of mines. The section regarding power and authority to enter and examine mines, quarries, wells, mills, reduction works, refining works and other properties and buildings, relates merely to the gathering of data to comply with the provisions of the act. The antidiscriminatory law which forbids the sale of a product at a less price in one section of the state than in another is particularly beneficial to the oil industry. Governor Johnson did not sign the act providing for the protection of oil wells for the infiltration of water from other wells. Only a few of the oil men had any hope or expectation that this act would become a law.

DENVER—AUG. 30

The Building of the Moffat Tunnel seems now in a fair way to be commenced. The tunnel is on the Denver & Salt Lake R.R., and will cut through the main Rocky Mountain range about 50 miles west of Denver at an elevation of approximately 9000 ft. above sea level, will be 6 miles long, and penetrate the mountain half a mile vertically below the summit. The bond election is expected to be held about Oct. 15. Meantime, an agreement upon the terms by which the tunnel may be built has been reached by the tunnel commission and City Attorney, I. N. Stevens, and will be submitted to Newman Erb, president of the Denver & Salt Lake R.R., at once. It conforms, except in minor and unimportant details, to the draft of an agreement submitted several weeks ago by Erb to the commission, and it is believed that the instrument, as amended by the commission, will be acceptable to both the city and the road. The commission states that it desires to provide a tunnel for the purpose of supplying the city and county of Denver with water and electricity for use by the inhabitants thereof, and is of the opinion that such a tunnel can be most economically constructed by subjecting it to railroad transportation purposes. For this reason the tunnel commission believes it advisable to grasp the present opportunity to construct a tunnel, which shall be useful for transportation, water and electricity alike. The general plan in a few words is as follows: Three experienced engineers to go to work, within 30 days, to select final site; city's share of cost must not exceed $3,000,000; any excess cost to be paid by railroad; city must have perpetual easement for transmission of electric current and water; title to tunnel site and its approaches must be vested in the city and county of Denver; company agrees to provide trackage rights for other roads 30 miles east of tunnel and 72 miles west, and railroad is to furnish electric current necessary for operating through the tunnel. It is expected that the tunnel will intersect many metalliferous veins, which are indicated on the surface, and the city is to be given title to all mineral veins or deposits. The cost will be probably $6,000,000 and the time required at least six years.

BUTTE—AUG. 27

The Introduction of the Mono-Rail system of transportation in Montana has been undertaken by the Industrial Transportation Co., a Montana corporation having its headquarters at Butte, capitalized for $100,000, in shares of stock of $1 par value. The officers of the company are: H. H. Edwards, president; D. Van Buskirk, secretary; and F. Smazel, treasurer. The object of the company is to invest the money from the sale of stock in building a system of roads in Montana. There are a number of mining districts in the state which are prevented from being large producers of precious metals only by the prohibitive cost of constructing railroads for transporting the ore to market. The reason for this is, of course, the great expense incurred in grading roads in the uneven, mountainous country surrounding these locations. With the single-rail system, however, the necessity of grading is done away with, as the road is built upon uprights so placed as to maintain an even grade. The company has on exhibition a working model of the motor used in hauling. The motor is situated midway between the two swivel trucks, and power action is direct on the drive wheels, which have a 10-in. face. If the grade is not too steep, the friction grip between the drive wheels and the rail is sufficient to prevent slipping, but with a steeper grade a cog rail may be employed. When electricity is available for operating the motor, the current may be conducted by trolley, or by heavy wire running along the sides of the track. The car which is designed to carry a minimum of about 20 tons of ore, is placed over the motor, the entire weight of car and motor being on the drive wheels. Trailers may be used.

CALUMET—Aug. 30

Conditions Throughout the Strike Zone of the Lake Superior copper district were during the last week devoid of serious disturbances. The strikers held several parades early in the mornings at Calumet, at the time when the men were going to work at the Calumet & Hecla property. These demonstrations consisted of 300 to 500 men in line, accompanied by several women. The women throughout the district are doing picket duty, and are becoming a disquieting factor in the situation. They become bolder on each successive appearance and some of them have become abusive in their language. At the South Range, several non-union men have been attacked by parties of these women, who have thrown stones, and used brooms as weapons. Several arrests have been made, and it is becoming evident that the next outbreak will be the result of the women pickets. At the Mohawk mine, union men have been operating the underground pumps and the boilers for the pumps, but the union officials have called these men from their posts and the property is again flooding. The Calumet & Hecla is operating at 11 of its shafts and is shipping about 1800 tons of rock to the mill daily. Superior is shipping about 300 tons of rock daily and the No. 2 shaft of the Isle Royale is also shipping ore to the mills. The Quincy is operating on a limited scale as is the Champion and Baltic of the Copper Range. Additional men are reporting for work daily at several of the properties. Some of these men are those who have left the union ranks and others are those who had been intimidated and have been afraid to go to work. The military forces have been further reduced, but more men have been added to the mounted patrol.

The mines will be months in getting back to normal working conditions. It is slow work. In all cases where work has been resumed the English, Scotch, Irish and Welsh miners were the first to return to work while the Scandinavians have been quite as loyal. The Victoria never suspended. The White Pine too has been operating two shafts right along, none of the miners at either of these properties having affiliated with the federation. It is generally under-

stood that neither the Franklin, nor the Winona are in any hurry to resume operations, being content to wait until there is no sign of trouble of any kind and the labor market straightens out. There have been rumors to the effect that the Winona would suspend operations indefinitely. These stories are untrue. The Winona recently installed a machine in the stamp mill that is doing satisfacory work. In fact it is confidently believed that at last the concentration and extraction problem which has been keeping Winona out of the paying class for a good many years has been solved. Winona rock shows up fine in assays but not in mill results, the copper being flaky and getting away in the washing in the mill. The new process aims to recover this flaky copper. It was working out very satisfactorily when the strike came along and caused suspension of operations.

The failure of the strike can be laid to the crude methods followed by the officials of the Western Federation of Miners. In the first place they practically turned the management of the strike over to the Socialists and that means the Finnish Socialists for the others are few. The Socialists made the mistake of thinking that the strike offered them an opportunity for the spread of their doctrines. Instead of that it has resulted in awakening among the entire people of the copper country a feeling of resentment against them. Up to this time the public here had been prone to look upon the Socialist movement, more noticeable among the Finns than any others, with tolerance. Now they believe that the strike is an outgrowth of the development of this movement. It is pretty generally understood that the majority of the Socialists will hold out for a long time. In fact it is known that they will not return to work, for one most important reason, that the mine managers will not take them back, even when they do desire to get on the pay roll again. Then, in bringing in speakers like Mother Jones, John Walker, Miller, Cannon and others the leaders misjudged their people. Mother Jones gave the usual vituperative harangues, cursing and swearing and abusing religion, workmen and everything else. It was pitiable. It reacted dangerously for the strike leaders. Then Walker, Cannon and Miller abused the soldiers of the Michigan National Guard, charging them with all manner of offenses known to be untrue. The agitators overdid the game. They made their charges and their addresses too strong, so ridiculous in fact that they lost whatever good effect they might have secured by the very exaggeration of their detail. John Mitchell was here for two addresses. He made fair labor talks and while he promised the local federation members pleasure if they won and sadness if they lost he assured them it was their fight and not his. Incidentally he didn't promise any financial assistance. That was something of a disappointment too. Mitchell did not have as large audiences as did Mother Jones. Most of the crowds that heard Mitchell could not understand him, as they had a rather limited knowledge of English. Another thing that has worked to the detriment of the strike leaders was the failure to make good on the promises of strike benefits. While it was not put down in writing the fact is that the organizers for the federation working before the strike started and immediately afterward promised members that they would receive $1 per day strike benefit, from the day the strike started, the money to be paid after the strike had been in operation for 30 days, this money to come from the national organization. No outside money has as yet come into the district to help the strike, excepting funds from the Butte federation men. That money came, accompanied by a couple of Butte federation members who are here to see that it goes to needy strikers, not to agitators. The only benefits that have been paid have come out of the local treasuries, and the sick fund has been drawn on for most of this money. Fat fees to lawyers, large expense accounts to agitators have eaten into the funds materially and all the talk of hundreds of thousands of dollars from other sources, seems so far to be founded on hopes and nothing more material.

MIAMI, ARIZ.—Aug. 27

The Inspiration Consolidated, vs. New Keystone suit, was argued in the Superior Court, Aug. 26. Judgment was in favor of New Keystone. The legal issue was whether or not a connecting drift or tunnel right-of-way constituted a public use. The importance of the case and novelty of the issue led to the employment of eminent counsel on both sides. Curtis H. Lindley, author of "Lindley on Mining Law," urged for Inspiration Consolidated that the court accept the view entertained in Nevada and Utah, that mining is the dominant industry and that economical progress of industry is a community benefit in which the public participates, and therefore a public use in a liberal sense. R. L. Alderman, of Alderman & Elliott, attorneys for the Miami Copper Co., contended for the New Keystone, that the provisions of the constitution of the State of Arizona show adoption of the view entertained in Washington, that no private industry should be habilitated with exceptional powers of eminent domain granted mining companies in Nevada and Utah. Inspiration Consolidated has announced the intention of carrying the case to the highest court.

CORDOVA, ALASKA—Aug. 10

An Adverse Report on Bering River Coal is expected by Alaskans. It is thought that such a report will be submitted to the authorities in Washington on the test of the 700 tons of coal mined from the Bering River coalfield which is now aboard the U. S. cruiser "Maryland" on the way to San Francisco. The test of the Bering River coal has not been a success. It has been repeatedly charged that the government officials, either intentionally or otherwise, mined coal of an inferior quality. The better grade was available but it was not brought to light. The "Maryland" did not get far along with its harbor tests. In starting to make the test the engineer of the "Maryland" soon realized that the coal had been exposed to the elements to such an extent that it was so broken and wet that the coal would cake and almost put out the fire. The coal will be dried before making the test in San Francisco harbor but even then little is hoped for in the ultimate result for the reason that most of the coal brought out has been found to be largely mixed with slate and crushed coal which has cost the Government to date over $100,000. It is hard or almost impossible to convince an Alaskan that in regard to the country's coal fields, a little "job" is not being "put over" by those on the "inside."

McCARTHY, ALASKA—Aug. 7

A Shushanna Report by Dr. Charles Cairnes, the Dominion geologist who has just returned from the scene of the latest Alaskan gold discovery states that the strike is undoubtedly rich, but the known area is as yet necessarily limited. He reports that he found good gravel on four creeks. The claims extend to the Canadian side. He and all his party staked placer ground. Cairnes' report is particularly gratifying and bears out the reports brought out from the new diggings by several prospectors who have come out to replenish their stores. Andy Taylor one of the three discoverers who brought out 190 oz. of gold "dust," July 25 has received an assay report from the Canadian Bank of Commerce that it contains gold worth $3185 and silver worth $17. The dust was the result of four days work by two men and the area from which it was taken was about 25 ft. square. The depth of gravel is from 18 in. to 3 ft. on Taylors claims. The largest nuggets found were worth about $20, but many have been found ranging in value from $2.50 to $8. Chief of Police Henneke of Cordova who arrived at McCarthy, Aug. 5, states that practically all the claims have been staked on Johnson Creek and its tributaries, Bonanza and Little Eldorado, and on Wilson with its tributaries, including Alder Gulch, Snow Gulch, Glacier Gulch, Big Eldorado and Gold Run. About 300 claims have been staked so far. He further states that Guando Creek about 12 miles long and just east of the new diggings has a few stakes at its mouth and that there are numerous other large creeks on which good holdings may be developed. Most of the best known creeks are held and those men who are coming in have not brought sufficient provisions to prospect extensively. The Hamshaw expedition which came in upon the first news of the discovery has bonded the claims of Billy James and his partners at Discovery for $150,000. At the mouth of the Eldorado there is a good quantity of red porphyry, rough and decomposed, which goes 35 to 50c. per pan. The Hamshaw people are preparing to hydraulic this as their rights give them 1000 miners inches of water. There are stakes at the mouth of this creek showing that quartz claims had been located on it in 1903. Carl Whitham, who has been seven years in the Copper River country has located a rich claim on Little Eldorado, No. 1 Above. He has taken out $1.25 per pan and is now whipsawing lumber to put up sluices. United States Commissioner and Recorder Morgan has established an office at the mouth of the Bonanza. He has received several hundred location filings and a few powers of attorney. Some of these powers were filed after the claims had been located, and a few are signed by Canadians, as a consequence of which there have been instances where Americans have relocated claiming that unless a man is a citizen of the United States or has declared his intention to become such, that he has no rights. About 150 gold seekers came in Aug. 6 from Cordova. Falcon Joslin, a Fairbanks railroad man and well known Alaskan states that he will put in a wireless outfit at the new diggings. The collector of customs at Whitehorse has sent out word that he has received notice from Ottawa that goods can be transported over the border without paying customs duty.

THE MINING NEWS

ALASKA

ALASKA TREADWELL (Douglas)—In July 77,973 tons of ore milled yielded bullion and concentrate worth $192,435 or $2.49 per ton, $87,165 being estimated net profit.

ALASKA MEXICAN (Douglas)—In July 17,493 tons of ore treated yielded bullion and concentrate worth $37,066 or $2.14 per ton, $9923 being estimated net profit.

ENSTROM BROS. (Fairbanks)—These Ester Creek placer operators have been forced to close their plant because of an excess of water in the drifts and an undersupply at surface for sluicing.

HUDSON BROS. MINING CO. (Fairbanks)—J. B. and N. R. Jesson have sold to Michael Beegler their one-fourth interest in seven lode claims on the left limit of Ester Creek, a one-fourth interest in the stamp mill erected last autumn, and half interest in the Louis association placer claim. The consideration was $6000. The claims are now being developed by the Hudson company.

J. GIUS (Fairbanks)—Two Bagley bottomless scrapers of 2½ cu.yd. capacity each have arrived for use in opencut work on Pedro Creek. All wearing parts are of manganese steel. A 50-hp., three-drum, double-cylinder engine has been installed for the scrapers. For night work a De Laval electric-lighting set with a capacity of five arc lights has been purchased. Charles Gius has ordered two Bagley scrapers of 1½ cu.yd. capacity, and a De Laval steam turbine-driven, direct-connected centrifugal pump for his operations.

ARIZONA

Gila County

A SMELTERY NEAR MIAMI, states the "Arizona Record," is to be built by the International Smelting & Refining Co. The site is at Burch between the pumping station of the Miami Copper Co. and the Fuller ranch where the Miami Wash converges with Pinal Creek.

Maricopa County

A MILL IS TO BE BUILT on the property of Dan Ainsworth at Morristown. A shipment of lead-silver ore from one claim was made a short time ago.

SUNFLOWER CINNABAR MINING CO. (Phoenix)—A 4-ton pipe retort has been hauled to the property on Sycamore Creek in the Mazatzal Mountains near the old Sunflower ranch.

MONTEZUMA (Morristown)—It is reported that an option has been taken on this old lead mine. The mine was worked many years ago by the Indians, probably for the various oxides which they used for paint.

Mohave County

NEW JERSEY—The concentrator is reported to be nearing completion and will soon be in operation.

COPPER GIANT (Hackberry)—A compressor has been installed and machine drills are now in use. This mine was recently purchased by representatives of W. A. Clark. Development work is showing unexpected richness in copper.

CHESTER (Chloride)—Much ore has been shipped during the last few months; some of it assayed $100 per ton in silver and lead. At present there is a large shoot of good shipping ore in sight, opened in recent development work.

Pima County

IN THE OLD HAT DISTRICT in Santa Catalina Mountains, Copper Queen engineers are examining copper prospects.

CALUMET & ARIZONA (Warren)—The preliminary survey of a railway from Tucson to the properties of the company in the Ajo district is being made.

Pinal County

REYMERT (Superior)—Development work is confined to the shaft and as soon as it is finished extensive development will be done.

AJAX—The shaft is now down 180 ft. It is out of the ore but where it left the vein there was 15 ft. of ore assaying well in copper lead and zinc with small amounts of silver and gold. The owners, Benedict Brothers, are working 10 men.

KELVIN-SULTANA (Kelvin)—The raise from the 300-ft. level is up 25 ft. and the first intermediate level has been started. At this place the vein shows 20 in. of clean chalcopyrite and more than 2 ft. of concentrating ore. Work has been resumed in the No. 1 west drift at the 300-ft. level.

Yavapai County

SENATOR (Prescott)—The first Monell slimer to be used in Arizona has been introduced at this mine.

POLAND (Prescott)—The mill on Big Bug Creek will be started for a test run; 100 tons of ore from the Fortuna mine, owned by Stukey brothers will be treated. This property is on Lynx Creek only a few miles from the mill and was formerly a producer. If results of the test are satisfactory the development work will be continued and regular shipments made.

CALIFORNIA

Amador County

HARDENBERG (Jackson)—The shaft will be deepened and another station will be opened. The ore from the drift has up to this time provided the mill.

GOOD HOPE (Jackson)—A suit has been filed in the superior court in San Francisco by George van de Mark and Charles Peters, owners of this property, against E. A. Freeman for the recovery of stock shares, which they claimed he had held in trust while promoting a sale of the mine.

VOORHIES (Sutter Creek)—The cyanidation of the sulphide dumps at the old reduction works has been begun. The indications are that the venture will be commercially successful. The tailing accumulated during several years of operation of the mine when chlorination was largely practiced. Benjamin Hall, of Nevada City, purchased the dump and built the cyanide mill.

EAST EUREKA (Sutter Creek)—The pumps, tracks and tools are reported to have been removed since the mine was closed down. It is said the company failed to exercise its purchase option, and that L. R. Poundstone, the owner, is again in occupancy. A 20-stamp mill was built early last year, but before the orebodies were sufficiently developed to assure the necessary ore supply. The mining has been well done and the equipment is modern.

Merced County

POCAHONTAS (Le Grand)—This copper mine is reported closed down.

Nevada County

OSCEOLA (Grass Valley)—This is one of the old mines in the Rough and Ready district, which is being reopened under the management of E. W. Tarr. The old tunnel has been cleaned out and a 150-ft. raise to the surface has been made, to be used as a working shaft.

BIRCHVILLE MINING CO. (Nevada City)—It is reported that permission has been obtained from the state water commission to use the waters of Weaver Lake for supplying the mine with power for generating electricity. The outlet of the lake is said to be owned by the Northern Water & Power Co., which may make a judicial test of the right of the commission to grant the permission.

Placer County

PROGRESSIVE MINING CO. (Iowa Hill)—The installation of a plant for working the old tailing dumps of the hydraulic mines on the north fork of American River is contemplated. The plant was tried out on the Bumpus hydraulic mine in Indian cañon. The method is an elaboration of the old sluice and riffle. The gravel is passed through a revolving screen, the fines going to a hopper and thence to the riffles.

Plumas County

A RECONNAISSANCE OF THE MINING INDUSTRY in Plumas County, has been begun by the State Mining Bureau; the report of the field assistant, Errol MacBoyle, is to be incorporated in the general report for 1913 to be issued by the bureau. This county was well represented in the thirteenth report of the bureau, which was the last of the general reports issued. That was in 1896. The large number of mines represented in the report indicated that Plumas was then one of the important mining counties of California. There were then 22 mills in operation. In most districts the mining seasons are short because of high altitudes and heavy snowfall. The industry has progressed, but not as rapidly as it would had there been more general publicity from official sources. Within the last two years the attention of mining investors has been drawn to the possibilities of the county through reliable news in the technical press.

San Benito County

PACIFIC QUICKSILVER MINING CO. (Dos Palos)—Seventy flasks of quicksilver were shipped from the mine in the Little Panoche district in July. Additional furnaces are contemplated, and a compressor and power drills will be installed.

San Diego County

MONTEZUMA (Warner Hot Springs)—Development is progressing at this mine in the northeastern part of the Mesa Grande district, or rather in a practically new district now known as the Warner Springs district, about 45 miles northeast of San Diego. There are 18 claims in the holding. The development is confined to two claims. The 200-ft. shaft will be deepened to 250 ft. and the second drift will be driven at that point. The drift at the 150-ft. level has disclosed good ore in stringers or shoots. The vein matter is irregular in width. The surface equipment consists of a 5-stamp mill, concentrating tables, hoist, compressor, power drills, ore bins and other equipment. The mill is being used for development and is operating full 24 hr. per day. Water for milling is taken from the shaft, which yields 75,000 gal. per day. There are springs at an elevation of 1500 ft. above the millsite that will furnish water for a large mill, which will be built if development warrants.

Shasta County

BALAKLALA (Coram)—James Doyle, for five years foreman of the Midas mine, has been engaged as foreman of construction in preparation for the testing of the Hall desulphurizing process to be installed by H. F. Wierum for the First National Copper Co.

COLORADO

Clear Creek County

WORKING TEST OF THE NEW EDISON PROCESS of ore dressing is at last to be made. Two carloads of machinery were shipped to the Waldorf Consolidated company in the East Argentine district which will be used at the mill near the portal of the Wilcox tunnel of that company. This mill which has been a failure to date, is to be equipped now with the Edison machinery under the personal supervision of J. B. Ballantine, chief engineer for Thomas A. Edison.

GILT EDGE MINES & SMELTING CO (Alice)—The Aurora group of 46 lode claims is being developed. An electrically driven compressor plant at the portal of the Aurora tunnel is being considered. The 20-stamp mill will probably be started in the near future.

Lake County

CORE DRILLING AT LEADVILLE is to be done by James J. Brown, of Denver, on a large undeveloped territory extending from the south side of Big Evans Gulch down and over the east end of Fryer and Yankee Hills, through which it is believed that the oreshoots of Carbonate, Breece and Iron Hills have their course. A bond and lease of 40 claims has been obtained from the several owners and a contract has been let to put down drill holes to a depth of 1000 ft. if necessary, to locate the oreshoots. When this is accomplished a main working shaft will be sunk. Three drills will be kept going steadily.

Larimer County

, A GOLD DISCOVERY has been made on the Rustic property by Norman Haskins. Thirty years ago, there was a gold excitement 65 miles northwest of Fort Collins, which drew hundreds of prospectors to the foot of the Medicine Bow range at that place. They sought the mother vein from which came the rich pockets of free gold; but they never found it. It is reported that Haskins was making an excavation for a waterwheel on the banks of the Poudre River and that he uncovered the vein, the ore of which assays $100 in gold per ton. Haskins is a wealthy man and will sink a shaft on the ore at once and use the water in the Poudre River to generate electricity to operate the mine.

San Juan Region

A TAILINGS TREAMENT PLANT is to be built by A. R. Wilfley and Otto Mears, of Denver, who have visited Silverton for the purpose of looking into the matter of treating the tailings of the old Silver Lake mine in Arrastre Basin on which a lease has been taken. The tailings are estimated at 300,000 tons, which it has been proved can be treated at a profit. A 500-ton mill will be built, and a system of concentration invented by Wilfley will be followed. The mill will be built near the North Star bridge and close to the Silverton Northern R.R.

Teller County

RAVEN & BEACON HILL CO. (Cripple Creek)—This property is operated by the Elkton company and the main workings connect with the Elkton by a crosscut at the 700-ft. level. The oreshoot now under development is producing 200 tons per month.

EL ORO (Cripple Creek)—The strike in the Eclipse tunnel on Battle Mountain is increasing in size and value. The ore is said to be 20 ft. wide. A shipment of 12 tons has just returned $450 net after deducting cost of freight and treatment. A 500-ton cyanide mill is being built by the company.

ELKTON (Cripple Creek)—Checks for the quarterly dividend were mailed Aug. 23. The dividend at the rate of 2c. per share will amount to $50,000 and will bring the total amount paid in dividends to date to $3,229,460. The gross production of the company as certified to the Colorado Springs mining stock association to Jan. 1, 1913, had amounted to $10,930,086. The property has produced approximately $11,250,000 gross.

IDAHO

Bonner County

IDAHO-CONTINENTAL (Port Hill)—The 14-mile transmission line being built from the power plant at Boundary Creek to the mine is nearing completion. Work at the powersite and at the mine is progressing satisfactorily, and there is little doubt but that the buildings will be completed and the equipment ready to operate by Christmas. The concentrator, office buildings, boarding and bunk houses are already under construction and soon will be ready for the roofs, and the power-plant building foundations are in shape to begin erection of the superstructure immediately. The sawmill will finish preparing the timbers for the different buildings soon and the last of the concentrator, compressor and electric machinery has been delivered and is ready to be installed. From 125 to 150 men are employed and this force will be increased if necessary to insure the completion of the work before winter.

Coeur d'Alene District

JACK WAITE (Union)—Important strikes in both the upper and lower tunnels have been made and it is said that the ground at the mouth of Tributary Creek, 2 miles from the property, will be prepared for a 300-ton concentrator. An aërial tramway will be built to connect the mine and mill and both are expected to be ready to operate by Jan. 1, 1914. Plans have been outlined for extensive development of both of the orebodies, and a 50-hp. steam engine and boiler have been ordered for operating the compressor plant when the water power is inadequate. The most important strike was made in the lower or 700-ft. level. The first oreshoot that showed in the upper workings was encountered. Extensive shipments of high-grade ore were made several months ago from this shoot in the No. 1 tunnel. The strike was made 2400 ft. in from the tunnel portal, 800 ft. vertically below the surface and 1200 ft. on the dip of the vein. The vein has been crosscut 3½ ft. from the foot wall and the hanging wall has not been reached. About 32 in. is high-class mill ore, the remaining 10 in. is clean shipping ore.

MINNESOTA

Cuyuna Range

ON THE JAMISON & PEACOCK TRACT near Crosby, active drilling operations have been commenced. The ground was recently optioned to a subsidiary of the Northern Pacific Ry. Four drills are at work. The property adjoins the town of Crosby. A peculiar feature, indicated by former drilling, is that this 40-acre tract contains two separate parallel ore lenses, one of Bessemer and the other non-Bessemer grade.

DULUTH-BRAINERD IRON CO. (Iron Mountain)—Sinking has been started in the 3-compartment shaft. The overburden is but 60 ft. deep. The ore is manganiferous.

BRAINERD-CUYUNA CO. (Brainerd)—This company has commenced to sink a shaft on lands one mile south of the village work having started on Aug. 11. The shaft will be sunk to a depth of 200 ft., when crosscuts will be driven to the ore. The company hopes to be shipping ore next season.

DELL DEVELOPMENT CO. (Manganese)—An exploration shaft is being sunk on the Harker-Hammel property under the direction of John T. Jones. Clearing and preliminary construction work has also been commenced at the site of the company's new furnace plant at Aitkin. The site is on the Mississippi River, enabling the rafting of firewood which forms a large proportion of the fuel used in the Jones reduction process.

PENNINGTON (Crosby)—Regular shipments are now being made from this mine, which shipped its first ore a few weeks ago. The work of stripping the property was started last February, and in the period of six months the company moved 1,100,000 cu.yd. of dirt. The ground was ideal for digging, not a large boulder being encountered. The overburden was sand for a depth of 75 ft. The little water that was encountered was easily taken care of. The property is under lease to Todd-Stambaugh & Co.

Mesabi Range

THE MINNESOTA STATE TAX COMMISSION toured the Cuyuna, Mesabi and Vermilion ranges recently, obtaining data on which to base valuations of the iron ore deposits for taxation purposes. Last year the ore land valuation was $260,000,000 or 22.55% of the total real property assessment in the state.

DRAINING OF CARSON LAKE is planned by the Oliver Iron Mining Co., which owns the ore under the lake, two miles west of Hibbing. Work is to be started at once and stripping operations will be begun preparatory to shipping ore next season. This property is well known because of the fact that the Oliver company for the past several years has exhibited at the Minnesota State Fair a model of the property, showing the lake,, overburden, ore, taconite, etc., in sections.

SUSQUEHANNA (Hibbing)—This pit, within a block of Hibbing's business center, is shipping 200 cars of ore per day. Steam shovels are now at work making a new cut around the pit, which is extremely narrow, in order to reduce the grades and permit greater production.

MISSOURI

Joplin District

PORTLAND (Carterville)—A modern concentrator is being built on the lease and the company expects to have it in operation within six weeks.

OLD EMPIRE (Galena, Kan.)—A second pumping plart is now being installed and plans are being made for the development of the ground which showed ore in eight drill holes. Drainage is the problem of prospecting.

BLUEBELL (Wentworth)—Twenty-two tons of blende and 15 tons of silicate were produced this week. The company has a large tract of land yet to be prospected. Some smaller properties near the Bluebell are taking out calamine and galena.

WEBB CITY-LEHIGH (Carl Junction)—After a month's shutdown this company has resumed operation. Operations ceased for a time in order that some repairs on the plant could be made. At that time a carload of ore per week was being turned out.

NILSON LAND (Carl Junction)—A. J. Shockley and associates, of Joplin, have taken a lease on 40 acres of this land and will sink two shafts. The tract has been well drilled and the operators plan to build a mill as soon as the shafts have reached the ore. The fifth drill hole just completed showed good ore at 170 to 190 ft.

BLOOMINGTON LAND (Galena, Kan.)—Holden & Boice have just opened up a rich shallow deposit of lead and zinc on this ground at a depth of but 9 ft. from the surface. Being in the heart of the old Galena camp it is one of the few spots overlooked in the years when the camp was first discovered and all the mining done was at a shallow level.

ISHERWOOD LAND (Carl Junction)—Prospecting by McClain & Gaines, of Galena, Kan., has revealed some promising deposits of blende. The work will be continued during the remainder of the summer and autumn. While the drill prospecting is going on, shaft sinking and underground development work is also being rapidly forwarded and another mill will be in operation soon. Hand jigs are now being used to clean the ore taken from the development drifts.

St. Francois County

LEAD MINERS RECEIVE INCREASED PAY but the union will not be recognized in the Flat River lead country. The miners agreed to accept a wage increase of 25c. per day. The plan of settlement was that submitted by the state board of mediation and arbitration. It provides that if any miner feels at any time that he has been unjustly treated he may submit his grievance to the state board of arbitration. The mine owners agree to abide by the decision of the board. The board of mediation, at the conference Aug. 26 at first proposed a wage increase of 20c. This was rejected by the strikers. The 25c. increase then was proposed and accepted by both sides.

MONTANA

Butte District

BUTTE ELECTRICIANS PLAN ANOTHER STRIKE to be started just as soon as sufficient time intervenes to admit of its being ordered in the regular way. If the men do not make their demand for another month, the electrification of the Butte, Anaconda & Pacific R.R. will be completed, and a large number of the linemen will be out of work.

CORBIN COPPER CO. (Butte)—Sinking on the Gambrinus is continuing at a record rate. The work is being done by contract.

PILOT-BUTTE (Butte)—The south crosscut on the 1800 level shows 9 ft. of 9% copper ore, from which the company will begin shipments. There are rumors that there is some doubt as to the apex ownership of this vein.

BUTTE & SUPERIOR (Butte)—Official statements are that the company is now earning good profits and has done so for some time. Both sections of the reconstructed mill are in satisfactory operation. The mill is treating about 1000 tons of ore daily.

BUTTE & MINNESOTA (Butte)—The company, which owns property about five miles southwest of Butte, has stopped operations, after having sunk a shaft a short distance. Options, secured several months ago, on a number of claims in the Wolf Creek district, between Helena and Great Falls have been taken up and development work will be done on them.

ANACONDA (Butte)—A runaway cage in the Berkeley mine so badly damaged the shaft that it has been decided to close the property. While repairs are under way, a change from steam to compressed-air hoisting will be made, and the Berkeley will be the twelfth mine of the company to be so changed. A change of hoisting power is being made in the Badger State mine, which is closed for the purpose.

Broadwater County

A TUNGSTEN DEPOSIT in the southwestern portion of the Radersburg district, in a belt of quartzite, will be investigated. It has been known for some time that tungsten ore occurs there, but whether or not of commercial value has not been ascertained. A tunnel will be driven into the formation.

Granite County

HICKEY HILL (Philipsburg)—Scherr Brothers have succeeded in trenching across the vein. A number of attempts to locate the vein in the past have proved unsuccessful.

ROYAL BASIN (Philipsburg)—The crosscut tunnel is now 750 ft. long and is expected to cut the vein at about 800 ft. On No. 3 level, a drift is being driven on copper-sulphide ore of good grade carrying 10½ oz. of silver per ton. Edwin Kirk, of the U. S. Geological Survey, recently made an examination of the mine and the surrounding district.

Lewis & Clark County

DRUMLUMMON (Marysville)—The St. Louis Mining Co. recently closed down this mine because of lack of funds to continue the necessary development work. The cost of repairing the old 60-stamp mill, which was much greater than estimated, is the chief reason for the cessation of operations.

SPRINGHILL (Helena)—During the last two months a force of men has been employed at this property, five miles south of Helena, and some ore rich in gold was recently encountered. A large tonnage of low-grade ore was blocked out several years ago, but on account of inadequate shipping facilities, it could not be made to pay. The company is contemplating the erection of a mill.

VALLEY FORGE (Rimini)—The lower crosscut tunnel on this property, situated 16 miles from Helena, recently cut the main vein at a distance of about 2200 ft. from the portal, tapping it at a depth of 900 ft. on the dip of the vein. The vein where encountered is well mineralized and contains low-grade ore, but the oreshoot opened on the upper levels has not yet been found. The company will drift 200 ft. on the lead, after which a crosscut will be run to the foot wall, and a raise driven from 500 to 600 ft. to connect with the winze above. After this connection is made all ore will be conveyed out of the mine through the tunnel.

Lincoln County

MONTANA PLACER MINING CO. (Libby)—A complete sawmill outfit is being taken to the plant on Big Cherry Creek, where it will be installed. The mill will be used to saw lumber for camp buildings and for about 1500 ft. of flume. Other improvements will also be made to put the plant in first-class condition for steady operation.

Madison County

PROSPECT (Virginia City)—It is probable that this mine will be reopened soon. It has been learned from tests that a profit can be made by cyaniding the dump ore and stope fillings. The advisability of erecting a mill is being considered by the owners.

MISSOURI—A suit brought by Charles F. Simon, owner of this lode claim, against John D. Hatfield and others, owners of the Tucker lode claim, and which was being tried at Virginia City, was recently settled out of court by the purchase of both claims by the Ellings of Virginia City. The claims were in conflict, the plaintiff claiming ownership of certain disputed orebodies by reason of previous location; and the defendants alleged that a side line crossing of the Tucker Apex gave them the ore under the rulings of the extralateral rights laws.

Missoula County

IRON MOUNTAIN (Missoula)—A force of 90 men is working at this property, and the company expects to increase the number this autumn. Regular shipments of ore are being made to the East Helena reduction works, the first-class ore assaying 35% lead and 70 oz. silver per ton. The shaft is down to the 2000-ft. level.

NEVADA

Humboldt County

CAUSTEN (Rochester)—A shoot of good-grade ore has been cut at a depth of 430 ft. This is of interest, as it demonstrates the depth so far known of oreshoots in Rochester.

ROCHESTER MINES CO. (Rochester)—A suit has been filed by John F. Cowan, for himself and other minority stockholders of the company, against Joseph F. Nenzel, president, to restrain him from selling 424,000 shares of the treasury stock at a price which, it is claimed, will mean a loss of $42,400 to the company. An injunction has been issued. It is claimed that the sale is not necessary, as the royalties from leases exceed expenses.

Lyon County

WHEELER—The cyanide plant, which will treat tailings from the mill, will soon be in operation.

McCONNELL (Mason)—Development on the oreshoot recently discovered on the 200-ft. level, is progressing with satisfactory results. The ore is sulphide, while that on the 100-ft. level was in the oxidized zone.

NEVADA-DOUGLAS (Ludwig)—Plans and specifications are being made for the erection of a leaching plant. Construction work on the first unit will be begun within the next 60 or 90 days; plant to consist of five units, each of 100 tons capacity.

MASON VALLEY MINES CO. (Thompson)—Ore receipts at the smelting plant for the week ended Aug. 21, 1913, were as follows: From Mason Valley mine, 2043 tons; from Nevada-Douglas, 850 tons; from other mines, 1403 tons; total, 4296, or a daily average of 614 tons. During the same week four cars of matte were shipped.

Mineral County

BLACK HAWK GOLD MINING CO. (Rawhide)—The two car loads of machinery for the new mill and cyanide plant are being freighted in from Fallon.

ANDERSON PROPERTY (Luning)—A raise has been driven from the glory-hole level to the upper-tunnel level, and this level has been connected, by a second raise, with the surface, where a second glory hole has been started. The drift on the glory-hole level has passed through 40 ft. of 5% copper ore. A shaft is being sunk at a point 50 ft. south of the main glory hole, and is now down 75 ft. A drift has been started north from the shaft to connect with the 50-ft. winze level. In the shaft, 15 ft. of wash was first passed through, then 20 ft. of ore, and this in turn was followed by iron-stained lime with good indications of another orebody at depth. Work on the Finney tunnel has been discontinued for the present. The mine is shipping 60 tons per day.

Nye County

PRODUCTION OF TONOPAH MINES FOR JULY totaled 48,227 tons of ore valued at $961,440, distributed as follows: Tonopah Mining, 14,250 tons; Tonopah-Belmont, 13,558; Montana-Tonopah, 4365; Tonopah Extension, 5016; West End, 4045; MacNamara, 2439; Jim Butler, 1603; Midway, 150; North, 2028, and Merger, 773 tons. Owing to the holidays there was a falling off of 340 tons compared with June.

LITTLE GREY (Manhattan)—The shaft has been sunk by lessees to the 260-ft. level, and development on this level is being done.

GOLD CRATER (Manhattan)—Crosscuts are being driven from the shaft, on the 160-ft. level, and two glory holes will be opened into them.

White Pine County

IN THE GRANITE DISTRICT, 25 miles north of Ely, W. D. Campbell and the Bairds have opened up a new deposit of lead ore, which appears to be a continuation of the Cuba mine, which has been worked the last two years by Vanderhoef and associates. From the Cuba mine several cars of ore, assaying about 70% lead, have been taken out in the last year. The ore from the new find will probably have to be milled, as it appears to be a large body of lower-grade ore.

NEW MEXICO

Socorro County

PACIFIC MINES CO. (Mogollon)—The 50-hp. motor for driving the compressor has been delivered. Drifts from the third level in the mine are being extended north and south: cut samples have been assaying $36 per ton.

MAUD MINING CO. (Mogollon)—The new shaft has reached a depth of 485 ft. and has been in good ore the greater part of the distance. The company is sending 10 tons per day to one of the custom mills, all coming from shaft development.

SOCORRO MINING & MILLING CO. (Mogollon)—Good progress is being made in the Clifton tunnel, which will intersect the Consolidated mine workings and drain the large flow of water encountered last year, on account of which the 500-ft. level into the Queen was abandoned and bulkheaded.

THE OAKS MINING CO. (Mogollon)—The main drainage and transportation tunnel on Mineral Creek, which will tap the orebodies of the district at depths of from 1400 to 1800 ft., is advancing steadily. In the east end tunnel group, Tunnel "A" has been driven 300 ft. and a contract was recently let for sinking a winze. Work is also going on in Tunnels "B" and "C." Ore from these developments is shipped regularly to custom mills.

ERNESTINE MINING CO. (Mogollon)—A contract was recently let for sinking the main shaft. Considerable water was encountered, necessitating the installation of a pump. A large amount of other development is constantly adding to the already large ore reserves. The mill is treating 150 tons daily with a battery of 30 stamps. Ten stamps additional are in reserve for emergencies. The new oil engines installed several months ago are giving satisfaction and the company now has surplus power.

OREGON

Grant County

MORRIS—This silver property near the summit of the Greenhorn Mountains is being worked by lessees, and the first shipment of sacked ore has been made. The mine was discovered by William Morris, a prospector, in the early days, and a patent was secured from the Government in 1878. In the days when silver was worth $1 or more per oz., this mine was a big producer, but has been idle for 20 years.

Josephine County

A GOLD STRIKE of considerable importance is causing excitement on Sucker Creek in the southern part of the county.

AN OFFICIAL REPORT will soon be issued covering the mines and mining business of Josephine County. Dr. Alexander Winchell has the work in charge for the state Bureau of Mines and Geology.

SOUTH DAKOTA

Lawrence County

DEADWOOD BUSINESS CLUB (Deadwood)—Trustees to administer the funds in connection with the Heidelberg property, recently taken over by the club, are as follows: George V. Ayres, John Treber, A. T. Roos, J. Goldberg and N. J. Thompson. The first monthly installment has been collected from the subscribers to the proposition, and by Sept. 1 work will have been started.

NEW RELIANCE (Trojan)—After a year's work with a continuous decantation and counter-current solution system of slime treatment, followed by dewatering on a Portland filter, Manager Bowman states that he is well pleased with the operation of the process. An extraction of from 85% to 87% is regularly made, and total milling costs are less than $1.25 per ton. The plant is treating 100 tons daily. During July the total cost of mining and milling was $2.48 per ton, a highly gratifying figure.

HOMESTAKE (Lead)—Connections have been made between workings from the De Smet shaft of the Homestake and the deep shaft of the Columbus, which was recently acquired by the Homestake. The De Smet is the most northerly shaft of the Homestake. Prior to breaking through, the Columbus shaft was drained by water skips and pumping. It is understood that this work in this ground is largely of exploratory nature, and future operations will depend upon the results of development work to be undertaken at once.

TROJAN (Trojan)—Among recent changes at this mill has been the installation of an Ingersoll-Rand single-stage compressor, with cylinder 14½x10 in., belt driven by a 30-hp. motor. This machine furnishes air for agitation of slime, at a pressure of 22 lb.; Superintendent Ellis hopes to reduce this to below 20 lb. The old compressor, which was a smaller machine, was removed to the blacksmith shop, where a Leyner drill sharpener and Leyner drill temperer have recently been added to the equipment. Grading is completed for the new addition to the mill which will house thickeners solution storage tanks and a tube mill, as well as some additional agitation tanks.

TEXAS

Cass and Marion Counties

A CARGO OF IRON ORE has been mined and loaded into the steamship "Ogeechee," at Port Bolivar. The cargo is the first shipment of Texas iron ore to be made from Port Bolivar to Philadelphia. The lot weighs 3300 tons and is consigned to Nicoll & Co.

UTAH

Juab County

GRAND CENTRAL (Robinson)—Ten cars were shipped the week ended Aug. 9, much of the ore coming from the 2300-ft. level.

GEMINI (Eureka)—Lessees are jigging low-grade ore from upper workings at the rate of 5 tons daily, producing one car of concentrates from three cars of ore. Later on it is planned to enlarge the plant.

AJAX LEASING CO. (Eureka)—This company, capitalized at 1000 shares, par value $10, with A. G. E. Hanke as president, has been organized to carry on prospecting in Tintic. A block of Gemini ground has already been secured.

Summit County

C. C. CONSOLIDATED (Park City)—Arrangements are being made to finance this company, and if successful it is proposed to carry the main shaft 1000 ft. deeper, from the 450 to the 1450 level. The property is in Thaynes Cañon.

DALY JUDGE (Park City)—Work is progressing on the Arvis slime plant at the mill. Practically all the machinery is on the ground awaiting installation. The work is in charge of Orson Allen, of Salt Lake. The report for the first six months of the year, issued Aug. 15, shows that the company suffered somewhat through the lower market prices for spelter. Mine conditions are good, and much development work is in progress especially toward the Bonanza Flat section of the property.

SILVER KING CONSOLIDATED (Park City)—A dividend of 25c. per share has been declared payable Sept. 16, thus adding another dividend payer to the state. The total distribution will be approximately $155,000. Of the 700,000 shares there are 620,000 shares outstanding with 80,000 shares still in the treasury. After this dividend is paid there will remain more than $500,000 still in the treasury, from the recent judgment which was paid by the Silver King Coalition. The 3-compartment shaft which is being sunk under contract is nearing the 1700-ft. level, and will be continued to the 1800 before work is begun on the ore which was cut in

Tooele County

INTERNATIONAL SMELTING (Tooele)—The usual quarterly dividend of 2% has been declared.

Utah County

THE WAGON ROAD IN AMERICAN FORK cañon has been improved, and kept in repair, since the county took the matter in hand. Throughout the summer there has been considerable activity here, shipments are being made, and development and mining are in progress. Lessees at the Mineral Flat, in working on one of several fissures cut in the main tunnel, opened 14 to 18 in. of first-class lead-carbonate ore, carrying some galena. Prospecting on another promising fissure nearby will be undertaken. One car of ore has been shipped from this property, and another is on the way to the railroad. Work is being done at the Dutchman, Whirlwind, Live Yankee and others.

MILLER—Kruse & Wingenfield, lessees on this property, are sacking ore for shipment.

MOUNTAIN DELL (Carbonate)—At a recent sale, Judge Baskin, a creditor to the amount of $6687, acquired the holdings of this company in American Fork Cañon.

PACIFIC (American Fork)—Lessees working this property are reported to be doing well, the company having apparently done the hardest part of the work before turning the ground over to the lessees.
sinking.

WASHINGTON

Ferry County

GWINN (Meteor)—A dam is being built which will generate power, and a concentrator is being erected.

POMEROY (Orient)—This mine which has been closed for a long time is to be reopened and operated on an extensive scale.

PARAGON (Northport)—This property has been leased to G. H. Safford, of Spokane, who is making a successful effort to concentrate the ore in the mine dump. Good copper ore is found.

LAME FOOT GROUP (Republic)—The Grandby Consolidated Mining, Smelting & Power Co. has taken an option on the 15 claims of this group and will improve them in the near future.

Okonogan County

OWASCO (Oroville)—A 100-hp. motor has been installed, and operations are to be resumed in a short time.

CANADA

British Columbia

SILVER STANDARD (Hazelton)—A shipment of 280 tons of silver-lead ore to the Trail smeltery is reported to have netted $30,000.

UNION (Gloster)—Shipments of ore from this group, 46 miles up the north fork of Kettle River from Grand Forks, commenced in July. The group comprises the Union, Union Fraction, Idaho and Paper Dollar. The ore is rich in gold and silver, assays giving returns of from $35 to $230 per ton. The paystreak is 16 ft. wide. The ore is being treated at the Granby smeltery, the treatment charges being $6 per ton. This is the first property in either Franklin or Gloster camps to undertake the shipment of ore on a commercial scale.

JINGLE POT (Nanaimo)—At this colliery where the coal miners have been on strike, an agreement was made with the United Mine Workers of America and operations will be resumed immediately with a force of 300 men, which will be added to as soon as conditions at the mine will allow. The settlement gives the miners an increase of about 10% in wages and recognition of the union, which has been the principal point at issue. The Western Fuel Co. is expected to make a similar settlement with its employees. The Canadian Collieries Co. (Mackenzie & Mann) are operating their Cumberland mine with Asiatics and nonunionists. As a consequence of the trouble at Extension, Ladysmith and Nanaimo between the strikers and nonunionists, which resulted in the sending of the militia to those points, about 200 of the nonunionists at Cumberland have left, which will reduce still further the limited output which the Mackenzie & Mann mine at that place has been making.

Ontario

DR. REDDICK (Larder Lake)—This mine is to be unwatered for an inspection, as negotiations have been opened for its sale.

NORTHERN CUSTOMS CONCENTRATOR (Cobalt)—An order has been placed by this company with the Power & Mining Machinery Co., for 80 stamps, to be delivered at Cobalt within 60 days.

JUPITER (South Porcupine)—This mine has been temporarily closed down, owing to the inadvisability of attempting to market treasury shares at present. The question of financing operations will be considered later.

REA (South Porcupine)—Stoping is being done on the 200-ft. level and the winze is being sunk deeper. The mill-run of the 5-stamp mill, which has been treating ore on the dump accumulated in sinking, has proved so satisfactory that an addition of 5 more stamps will be made.

DOME (South Porcupine)—All machinery for the proposed extension of the stamp-mill has been ordered, and it is expected that the 40 additional stamps will be in operation early next year, increasing the capacity from 370 tons daily to 650 tons or more. Six sand-leaching tanks will also be installed.

DOME LAKE (South Porcupine)—At a special meeting, held in Toronto, Aug. 25, the bylaw increasing the capitalization from $500,000 to $750,000, was ratified by the shareholders. They refused to sanction another proposal of the directors to offer 100,000 shares for sale at a discount of 65% until fuller information as to the condition of the company had been furnished, and another meeting will be called.

THE MARKET REPORT

METAL MARKETS

Copper, Tin, Lead and Zinc

Copper—The market is strong and advancing. The situation is determined fundamentally by the remarkable statistical position. Whenever copper is wanted in any quantity, the price advances. Up to the end of August electrolytic copper was to be had at about 15¾c., delivered, usual terms, and some millions of pounds were disposed of on that basis, going both to European and American consumers. These transactions, although not very large, appear to have absorbed all the copper remaining in second hands, and as producers generally view the copper position with great confidence they readily advanced their prices as the demand developed. However, some of the producers seem to have anticipated the market in their asking prices.

Consumers generally are now well covered for September, although there is still some inquiry for this month's delivery. Refiners are still in arrears with their shipments and early copper is scarce. There is still a good deal of copper that must be bought for October, both by the home trade as well as by the European buyers. The bulk of the business now being done is in contracts for this delivery. Europe appeared as an active buyer on Sept. 2 and prices advanced sharply.

The Lake copper that was in the hands of dealers and the smaller producers for sale now appears to have been wholly absorbed. The only interest that can now supply Lake copper, so far as we know, is the Calumet & Hecla, which is asking 16½c. for its special brand and 16⅜c. for the Buffalo electrolytic.

At the close we quote Lake copper at 16⅜@16½c.; and electrolytic in cakes, wirebars, or ingots at 15.80@16c. Casting copper is quoted nominally at 15.40@15.50c. as an average for the week.

There was a clerical error in our quotation for casting copper last week. The figure should have been 15⅛@15⅜c.

The London standard market has advanced steadily from £71 for spot and £70 18s. 9d. for three months on Aug. 28, to £72 12s. 6d. and £72 7s. 6d., respectively on Sept. 3. The stock of copper in Europe is steadily decreasing, and there is decidedly more speculative interest shown than for some time past.

Base price of copper sheets is now 21c. per lb. for hot rolled and 22c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 17@17¼c. per lb., carload lots at mill.

Copper exports from New York for the week were 5380 long tons. Our special correspondent gives the exports from Baltimore at 2371 tons for the week.

Tin—The London market on Thursday of last week became exceedingly strong, due to large orders which were placed from this side and reported covering of bear sales which were due the beginning of September. This advance, however, was not maintained during the balance of the week, and prices receded, due to the fact that buying from this side ceased and that bear buying seemingly was completed. The favorable statistics published at the beginning of this week again imparted a firmer tone to the market, which has now risen rapidly. Consumers' buying in this market is not of great moment, but active trading has taken place between dealers and speculators. The close is strong at £197½ for spot and £196¾ for three months, and 43½c. for September tin here.

Spelter—There seem to be cross-currents in this market. Consumers generally do not appear to be well covered, but they have been holding back. On the other hand, some of the producers have evinced a desire to market some metal. Some moderate tonnages have been sold at considerable variation in price. In the early part of the week the tone of the market was rather soft, but since then demand has improved and at the close the market appears strong. We quote St. Louis at 5.60@5.65c., and New York at 5.75@5.80c.

The London market is higher, good ordinaries being quoted £21⅝; specials £22⅛.

On Aug. 29 the base price of zinc sheets in carload lots was advanced 25c. per 100 lb., to $8 per 100 lb. basis, less 8% discount, f.o.b. cars, Peru, Ill. Extras and discounts unchanged.

Lead—The strike in southeast Missouri having terminated about the middle of last week, supplies from that direction are again coming into the market and the price for lead at St. Louis has receded somewhat. We quote 4.65@4.70c., St. Louis, 4.75c., New York, market firm.

The London market is strong at £21 for Spanish and £21⅜ for English lead.

Other Metals

Aluminum—The market is quiet, and still waiting on the tariff. Domestic No. 1 ingots are selling for 22@22½c. per lb., and foreign, in bond, at 18¼ cents.

Antimony—The market is good, with no change in prices, which stand at 8.35@8.40c. for Cookson's; 7.75@8c. for Hal-

DAILY PRICES OF METALS

NEW YORK

Aug.-Sept.	Sterling Exchange	Silver	Copper		Tin	Lead		Zinc	
			Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
28	4.8595	59⅝	16 @16½	15.55 @15.60	43⅝	4.75	4.65 @4.70	5.75 @5.80	5.60 @5.65
29	4.8585	59⅝	16 @16½	15.55 @15.65	42¾	4.75	4 65 @4.70	5.75 @5.80	5.60 @5.65
30	4.8575	59½	16 @16½	15.55 @15.65	42¾	4.75	4.65 @4.70	5.75 @5.80	5.60 @5.65
1	.....	...	...	.....	...	....	....	.....	.....
2	4.8575	59⅜	16⅜ @16½	15.70 @15.80	43	4.75	4.65 @4.70	5.75 @5.80	5.60 @5.65
3	4.8565	59⅜	16⅜ @16½	15.80 @16.00	43½	4.75	4.65 @4.70	5.75 @5.80	5.60 @5.65

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.25c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

Aug. Sept.	Silver	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
		Spot	3 Mos	Best Sel'td	Spot	3 Mos		
28	27½	71	70 15/16	75⅜	197¼	196⅜	20⅜	21
29	27½	71⅛	71	76¼	194	193½	20¼	21⅛
30	27½	....	....	....	....	....	....	....
1	27½	71 1/16	71 1/16	76¼	193¾	193¼	20¼	21⅛
2	27 15/16	71⅛	71 1/16	76½	195¼	194¾	20⅜	21⅛
3	27 15/16	72⅛	72⅛	77	197½	196¾	21	21⅛

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

lett's; and 7.25@7.50c., for Chinese, Hungarian and outside brands.

Quicksilver—The market is fair and steady. New York quotations are $40 per flask of 75 lb., with 60c. for small lots. San Francisco, $40 for both domestic and export. London is £7 5s. per flask, and £7 quoted from second hands.

Selenium—For large lots, 100 lb. or over, $2.75@3.50 per lb. is quoted; while $4.50@5.50 is paid for retail orders.

Gold, Silver and Platinum

Gold remains on the open market at 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American gold. The receipts are chiefly from the Cape and South America, with engagements for Bombay.

Iridium—The trade in this metal is dull, with $83@85 asked.

Platinum—The market has begun to steady somewhat, and $43.50@45 per oz. is being paid. For hard metal, $47.50 @50 is being quoted.

Silver—The market has remained quiet but steady during the past week, buying for the Indian Bazaars causing firmness. China banks have also been buyers for forward delivery and the market closes steady at 27 9/16d. in London.

Exports of silver from London to the East, Jan. 1 to Aug. 21, reported by Messrs. Pixley & Abell:

	1912	1913	Changes
India	£5,087,700	£4,639,000	D. £448,700
China	933,500	542,000	D. 391,300
Total	£6,021,200	£5,181,000	D. £840,000

Imports of silver at New York and Perth Amboy, week ended Aug. 16, $360,979 from Mexico and Central America. Exports were $705,983, to London and Paris. Last week's report should have shown $196,215 more than was given.

The United States Mint makes the following report of coinage for the fiscal year ended June 30, 1913:

Gold:	Coins	Face Value
Double eagles	462,091	$9,241,820.00
Eagles	809,050	8,090,500.00
Half eagles	2,140,099	10,700,495.00
Quarter eagles	810,165	2,025,412.50
Total gold	4,221,405	$30,058,227.50
Silver:		
Half dollars	3,982,235	$1,991,117.50
Quarter dollars	4,144,235	1,036,058.75
Dimes	4,210,235	421,023.50
Total silver	12,336,705	$3,448,199.75
Nickel, five cent pieces	57,235,371	$2,861,768.55
Copper cents	112,833,390	1,128,333.90
Total	186,626,871	$37,496,529.70

In addition the mint coined 385,000 silver pesos, 743,565 silver 20-centavo pieces, 1,510,255 silver 10-centavos and 5,001,000 copper centavos for the Philippines. There were also made small silver coins to the value of $42,845 for Costa Rica.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—Aug. 30

The base price paid this week for 60% zinc ore was $48 to $49 per ton. The base price paid for 80% lead ore was $58 per ton.

SHIPMENTS WEEK ENDED AUG. 30

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	3,657,270	.....	1,076,720
Year to date	99,210,430	4,587,990	40,432,950

Shipped during week to separating plants, 3,454,590 lb. zinc ore.

JOPLIN, MO.—Aug. 30

SHIPMENTS WEEK ENDED AUG. 30

	Blende	Calamine	Lead	Values
Totals this week..	10,631,330	807,720	1,675,770	$313,420
Totals, 8 months..	376,583,840	27,358,370	61,651,990	$10,412,859

Blende value, the week, $253,055; 8 months, $8,433,919.
Calamine value, the week, $11,880; 8 months, $349,401.
Lead value, the week, $48,485; 8 months, $1,629,539.

The high price of blende is $53, the base per ton of 60% zinc ranging from $48 to $50 for choice grades and $47 to $48 base for blende carrying an excess of 8% iron. Calamine sold on a base of $21 to $24 per ton of 40% zinc. The average of all grades of zinc is $46.16 per ton. Lead remained throughout the week unchanged from the last week, $58 per ton of 80% metal contents, and the average of all grades $57.86 per ton.

IRON TRADE REVIEW

No material change in the iron and steel situation is thus far apparent, though the market enters September under improved auspices, due to the fact that actual consumption of steel has continued at practically the best rate ever reached, through a summer in which the market has been practically stagnant. The normal trend at this time would be toward more activity, and such activity would easily ensure the mills operating full throughout the year. For months they have been running out of orders, and yet they are still operating practically full.

Some large structural contracts are coming on the market which will require a great quantity of material. Most of these, however, are not yet closed. Many smaller orders are reported, and business in that line is pretty active.

PITTSBURGH—Sept. 2

There is a wide open market as to finished steel prices, no semblance existing of the control which has formerly been exerted so often. There are hardly any recognized quotations, as mills freely cut prices to obtain very desirable orders, while they adhere to higher figures in case of less desirable business. Structural shapes are now shaded enough to make 1.40c. fairly quotable as the ordinary market, against 1.45c. formerly held. A similar recession occurred a week or more ago in plates. Bars are firm at 1.40c., really firmer at that figure than are plates and shapes at 1.40c. Hoops are held at 1.60c., except in rare instances. In tubular goods the irregularities are somewhat more frequent. In wire products, on the other hand, no further declining tendency is observed. Sheets have yielded no further. Tin plate is between seasons, and not a factor. Unfinished steel has not declined further as to minimum quotations, but there are more sellers at the reduced level lately quoted.

Pig Iron—W. P. Snyder & Co. announce its August averages for bessemer and basic pig iron, computed from the actual sales reported in the trade. The bessemer average is $15.657, Valley, against $15.4085 for July, an advance of 25c., while the basic average is $14.045, against $14.227 for July, a drop of 18c. These averages are fairly representative of the market as openly quoted, basic having sold at $14.25 early in July, but lately at $14, while bessemer grew stronger during August, advancing from $15.50 to $15.75 about the middle of the month, and now showing a tendency to go to $16, on account of scarcity. There is little prospect of the steel corporation buying any bessemer iron, as reported in some quarters. The market for all grades has been extremely dull, but with quotations very well maintained. We quote: Bessemer, $15.75@16; basic, $14; No. 2 foundry, $14; malleable, $14.25; forge, $13.50, all at Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The regular sellers continue to quote prompt and forward at $56, Baltimore, freight to Pittsburgh being $2.16, but there are sellers willing to shade these figures, at least on prompt, by about a dollar a ton. The market continues very quiet.

Steel—The declining tendency in unfinished steel continues to be seen, but rather through more sellers quoting reduced prices than by the lowest quotation found coming down any more. Buyers are holding aloof from the market, expecting to see more attractive prices within a week or two. There are a very few sellers at $24 for billets and $25 for sheet bars, f.o.b. maker's mill, Pittsburgh or Youngstown, but the highest quotation seriously made is only a dollar a ton above these figures, all mills having abandoned the idea of getting $26.50 for billets and $27.50 for sheet bars, the figures well maintained for several months.

Sheets—Mills continue to operate at 75 to 85% of full capacity. New business is fairly good, but only for prompt shipment, there being little contracting. Prices have shown no further declines in the past fortnight, and are well held. We quote: Blue-annealed, 10-gage, 1.65c.; black, 28-gage, 2.15c.; galvanized, 28-gage, 3.20c.; painted corrugated, 2.35c.; galvanized corrugated, 3.25c., per lb. Some mills are quoting about $2 per ton higher than these figures.

Pig Iron Production in Germany in July is reported by the German Iron & Steel Union at 1,646,882 tons. For the

seven months ended July 31, the total make was, in metric tons:

	1912	1913	Changes
Foundry iron	1,872,486	2,135,669	I. 263,183
Forge iron	310,342	301,011	D. 9,331
Steel pig	1,224,841	1,487,499	I. 262,658
Bessemer pig	227,668	209,847	D. 17,821
Thomas (basic) pig	6,435,011	7,080,522	I. 645,511
Total	10,070,348	11,214,548	I.1,144,200

The total increase this year was 11.3%. Steel pig includes spiegeleisen, ferromanganese and all similar alloys.

IRON ORE

The Question of Ore Rates is being again investigated by the Interstate Commerce Commission on new complaints that the rates from Lake Erie ports to the Columbus, Jackson and other districts are unequal and discriminatory as compared with those to the Pittsburgh and Wheeling districts. Meantime the rates recently filed are suspended.

Imports of Iron Ore via Baltimore amounted to 35,500 tons in the week ended Sept. 2, according to our correspondent.

COKE

Connellsville Coke—Recent rumors of irregularities in furnace-coke prices when traced to their source seem to hinge partly upon the offering of coke under standard at slight cuts from the regular figure of $2.50, and to the desire of a merchant house, so it is alleged, to break the market. The test of actual buying has brought out actual contracts for September at the full price of $2.50, for standard grade coke, and a fair volume of prompt business has also been done at this figure. Negotiations have been on in the past few days which, when concluded, will probably cover all furnace coke needed for September in addition to regular contracts, and at full prices for standard grade. The output of furnace coke, some 25,000 to 30,000 tons monthly, of the Hostetter-Connellsville Coke Co., controlled by the United States Steel Corporation, is temporarily on the market. The August tonnage was quietly disposed of at the full price, and a large part of the September output has already been closed, with negotiations on for the balance, all at the full figure. There are prospects that the coke will not be offered for October, being required by the Steel Corporation, and the absorption of this extra tonnage for August and September is taken as a clear indication of the strength of the market. We continue to quote: Prompt furnace, $2.50; contract furnace, $2.50; prompt foundry, $3, per ton at ovens.

Norfolk & Western Coal Tonnage for July, 1913, and for the seven months ending July 31, as compared with corresponding periods of 1912 in short tons shows as follows:

Destination	July		Seven Months	
	1912	1913	1912	1913
Coal				
Tidewater, foreign	116,339	155,762	950,893	1,032,082
Tidewater, coastwise	305,515	321,340	2,119,813	2,224,658
Domestic	1,577,396	1,666,790	5,994,907	10,318,604
Coke				
Tidewater, foreign	9,197	4,358	50,101	27,199
Domestic	88,030	106,351	789,338	924,152
Total	2,096,477	2,254,601	13,905,052	14,526,695

Fuel Production of the German Empire, half-year ended June 30, in metric tons:

	1912	1913		Changes
Coal	84,706,380	93,577,987	I	8,871,607
Brown coal	39,430,142	41,900,158	I	2,470,010
Total mined	124,136,522	135,478,145	I	11,341,623
Coke made	13,754,682	15,944,237	I	2,189,555
Briquettes made	11,612,454	13,182,282	I	1,569,828

Of the briquettes reported this year, 10,303,617 tons were made of brown coal or lignite.

CHEMICALS

NEW YORK—Sept. 3

The general markets are showing signs of improvement and the outlook is encouraging.

Arsenic—Trade is very dull, and prices are nominally at $3 per cwt., with perhaps $3.12½ for small lots. Most of that on the market is coming from Wales, Germany, Belgium, and Spain.

Copper Sulphate—August trade was rather better than usual for this month. Prices remain unchanged at $5 per cwt. for carload lots, and $5.25 for smaller parcels.

Nitrate of Soda—The market is steady. Quotations for the remainder of 1913 stand at 2.35c.; first five months of 1914, at 2.40c.; and last seven months at 2.35c. The nitrate producers have agreed to restrict their output by 10%, and it seems impossible that the lands to be auctioned shortly by the Chilean government can affect next year's output.

COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

	April	May	June	July	August
Alaska shipments	1,730,252	1,771,508	2,203,191	2,705,136	.....
Anaconda	23,800,000	25,600,000	21,500,000	22,100,000	22,500,000
Arizona, Ltd.	3,100,000	3,200,000	3,000,000	2,600,000	.....
Copper Queen	8,210,166	8,301,605	7,477,936	8,369,607	8,252,404
Calumet & Ariz.	4,500,000	4,300,000	4,000,000	3,800,000	.....
Chino	3,925,409	3,883,611	3,682,706	4,686,250	.....
Detroit	1,856,517	2,001,633	1,750,601	1,549,224	2,187,223
East Butte	1,400,000	1,268,595	1,055,646	.....	.....
Mammoth	1,450,000	1,700,000	1,750,000	1,800,000	1,750,000
Giroux*	600,000	625,000	610,000	610,000	.....
Mason Valley	1,264,304	1,186,560	1,097,014	908,892	.....
Miami	.....	1,943,900	2,612,000	.....	.....
Nevada Con.	5,650,000	5,933,275	6,344,863	5,403,919	.....
Ohio	690,001	650,071	537,400	601,700	.....
Old Dominion	3,040,000	2,749,000	2,511,000	2,526,000	.....
Ray	4,379,128	4,384,400	4,392,612	4,097,000	.....
Shannon	1,238,000	1,080,000	924,000	880,000	1,248,000
South Utah	132,267	200,000	185,000	140,000	.....
Tennessee	1,718,188	§1,037,115	1,379,220	1,247,804	.....
United Verde*	3,000,000	3,000,000	2,900,000	.....	.....
Utah Copper Co.	9,539,847	10,003,227	11,637,949	9,849,043	.....
Lake Superior*	17,000,000	18,705,000	16,500,000	17,500,000	.....
Non-rep. mines*	6,000,000	6,300,000	6,000,000	6,200,000	.....
Total prod.	104,224,079	109,824,500	104,051,138	.....	.....
Imports, bars, etc.	25,578,297	22,205,942	18,255,267	.....	.....
Total blister	129,802,376	132,030,442	122,306,405	.....	.....
Imp. ore & matte.	7,177,363	10,528,562	7,497,002	.....	.....
Total Amer.	136,979,739	142,559,004	129,803,407	.....	.....
Miami†	2,312,900	.....	.....	2,890,000	.....
Shattuck-Arizona	1,158,326	1,026,170	1,059,625	1,019,388	.....
Brit. Col. Cos:					
British Col. Cop.	794,000	.....	.....	.....	.....
Granby	1,857,452	1,782,570	1,789,000	.....	.....
Mexican Cos.:					
Boleo†	2,811,200	2,424,800	1,984,640	2,240,720	.....
Cananea	3,581,690	2,272,000	2,908,000	3,328,000	.....
Moctezuma	2,753,240	2,695,881	3,438,793	2,693,006	3,542,047
Other Foreign:					
Braden, Chile	1,512,000	1,150,000	1,804,000	1,046,000	.....
Cape Cop., S. Af.	586,880	387,520	414,400	.....	.....
Kyshtim, Russia	2,544,640	1,490,000	.....	.....	.....
Spassky, Russia	974,400	721,280	835,520	.....	.....
Exports from					
Chile	7,616,000	3,584,000	5,824,000	9,856,000	.....
Australia	6,608,000	7,840,000	7,616,000	10,304,000	.....
Arrivals-Europe†	10,545,920	13,661,760	5,277,440	11,728,640	.....

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

† Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

STATISTICS OF COPPER

Month	United States			Visible Stocks.		
	U.S.Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
VII.,'12	137,161,129	71,094,381	60,121,331	44,335,004	108,186,000	152,521,003
VIII.	145,628,521	78,722,418	70,485,150	50,280,421	113,299,200	163,579,621
IX.	140,089,819	63,460,810	60,264,796	46,701,374	113,568,000	160,269,374
X.	145,405,453	84,104,734	47,621,342	63,065,587	107,408,000	170,473,587
XI.	134,695,400	69,369,795	55,906,550	76,744,964	103,801,600	180,546,564
XII.	143,354,042	58,491,723	65,713,796	86,164,059	96,947,200	183,111,259
Year, 1912	1,581,920,287	819,665,948	746,396,452	.....	.....	.....
I. 1913.	143,479,625	65,210,030	60,383,845	105,312,582	78,491,840	183,904,422
II.	130,948,881	59,676,492	72,168,523	123,198,332	77,504,000	200,702,332
III.	136,251,849	76,585,471	77,699,306	122,302,890	81,244,800	203,547,690
IV.	135,353,402	78,158,837	85,894,727	104,269,270	87,180,800	191,450,070
V.	141,319,416	81,108,321	68,285,978	75,549,108	85,948,800	161,497,908
VI.	121,860,853	68,362,571	68,067,901	67,474,225	77,235,200	144,709,425
VII.	138,074,602	58,904,192	78,480,071	52,814,606	71,904,000	124,808,606
VIII.	.....	.....	.....	53,594,945	66,420,480	120,015,385

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

Assessments

Company	Delinq.	Sale	Amt.
Caledonia, Nev.	Aug. 14	Sept. 12	$0.025
Central Eureka, Calif.	Aug. 14	Sept. 14	0.025
Con. Imperial, Nev.	Aug. 28	Sept. 19	0.01
Crown Point, Utah	Aug. 30	Sept. 20	005
Eagles Nest-Hailstone, Nev.	Aug. 25	Sept. 22	0.003
Emerald, Utah (2d install.).	.....	Sept. 13	0.005
Empire, Ida.	Aug. 12	Sept. 12	0.002
Eureka, Ida.	Aug. 11	Sept. 11	0.001
Exchequer, Nev.	Aug. 28	Sept. 17	0.02
Florence	Aug. 16	Sept. 16	0.001
Hamburg-American, Ida.	Sept. 8	Sept. 29	0.000⅔
Hypotheek, Ida.	Aug. 15	Sept. 9	0.003
Iron Spar, Ida.	Aug. 16	Sept. 13	0.0025
Justice, Nev.	Sept. 8	Sept. 30	0.02
Lake Copper, Mich.	.....	Sept. 9	2.00
Lucky Calumet, Ida.	Aug. 11	Sept. 10	0.005
Morgan Argentine, Utah	Sept. 1	Sept. 16	0.005
Nabob, Ida.	Aug. 25	Sept. 22	0.005
New Hope, Ida.	Aug. 19	Sept. 19	0.002
Oreano, Ida.	Sept. 1	Oct. 1	0.0015
Potosi, Nev.	Sept. 4	Sept. 26	0.02
Slavonian, Ida.	Sept. 10	Sept. 30	0.002
Sonora, Ida.	Aug. 30	Sept. 16	0.002
St. Louis, Calif.	Sept. 22	Oct. 4	0.01
Sunshine, Ida.	July 1	Oct. 15	0.001
Tuscumbia, Ida.	Aug. 23	Sept. 23	0.003
Yellow Jacket, Nev.	.....	.....	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1911	1912	1913	1911	1912	1913
January	53.795	56.260	62.938	24.865	25.887	28.983
February	52.222	59.043	61.642	24.081	27.190	28.357
March	52.745	58.375	57.870	24.324	26.875	26.669
April	53.325	59.207	59.490	24.595	27.284	27.416
May	53.308	60.880	60.361	24.583	28.038	27.825
June	53.043	61.290	58.990	24.486	28.215	27.199
July	52.630	60.654	58.721	24.286	27.919	27.074
August	52.171	61.606	59.293	24.082	28.375	27.335
September	52.440	63.078	.....	24.209	29.088	.....
October	53.340	63.471	.....	24.594	29.299	.....
November	55.719	62.792	.....	25.649	29.012	.....
December	54.905	63.365	.....	25.349	29.320	.....
Year	53.304	60.835	.....	24.592	28.042	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York				London, Standard	
	Electrolytic		Lake			
	1912	1913	1912	1913	1912	1913
January	14.094	16.488	14.337	16.767	62.760	71.741
February	14.084	14.971	14.329	15.253	62.893	65.519
March	14.698	14.713	14.868	14.930	65.884	65.329
April	15.741	15.291	15.930	15.565	70.294	68.111
May	16.031	15.436	16.245	15.738	72.352	68.807
June	17.234	14.672	17.443	14.871	78.259	67.140
July	17.190	14.190	17.353	14.563	76.636	64.166
August	17.498	15.400	17.644	15.904	78.670	69.200
September	17.508	.....	17.698	.....	78.762	.....
October	17.314	.....	17.661	.....	76.389	.....
November	17.326	.....	17.617	.....	76.890	.....
December	17.376	.....	17.600	.....	75.516	.....
Year	16.341	.....	16.560	.....	72.942	.....

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN

Month	New York		London	
	1912	1913	1912	1913
January	42.529	50.298	191.519	238.273
February	42.962	48.766	195.036	220.150
March	42.577	46.832	192.619	213.645
April	43.923	49.115	200.513	224.119
May	46.063	49.078	208.830	224.143
June	45.815	44.820	205.863	207.208
July	44.519	40.260	202.446	183.511
August	45.857	41.582	208.351	188.731
September	49.135	.....	223.762	.....
October	50.077	.....	228.353	.....
November	49.891	.....	227.619	.....
December	49.815	.....	226.875	.....
Av. year	46.096	.....	209.322	.....

New York in cents per pound; London in pounds sterling per long ton.

LEAD

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	4.435	4.321	4.327	4.171	15.597	17.114
February	4.026	4.325	3.946	4.175	15.738	16.550
March	4.073	4.327	4.046	4.177	15.997	15.977
April	4.200	4.381	4.118	4.242	16.331	17.597
May	4.194	4.342	4.072	4.226	16.509	18.923
June	4.392	4.325	4.321	4.190	17.588	20.226
July	4.720	4.333	4.603	4.223	18.544	20.038
August	4.569	4.624	4.452	4.550	19.655	20.406
September	5.048	.....	4.924	.....	22.292	.....
October	5.071	.....	4.894	.....	20.630	.....
November	4.615	.....	4.463	.....	18.193	.....
December	4.303	.....	4.152	.....	18.069	.....
Year	4.471	.....	4.360	.....	17.929	.....

New York and St. Louis cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	6.442	6.931	6.292	6.854	26.642	26.114
February	6.499	6.239	6.349	6.089	26.661	25.338
March	6.626	6.078	6.476	5.926	26.048	24.605
April	6.633	5.641	6.483	5.491	25.644	25.313
May	6.679	5.406	6.529	5.256	25.790	24.583
June	6.877	5.124	6.727	4.974	25.763	22.143
July	7.116	5.278	6.966	5.128	26.174	20.592
August	7.028	5.658	6.878	5.508	26.443	20.706
September	7.454	.....	7.313	.....	27.048	.....
October	7.426	.....	7.276	.....	27.543	.....
November	7.371	.....	7.221	.....	26.804	.....
December	7.162	.....	7.081	.....	26.494	.....
Year	6.943	.....	6.799	.....	26.421	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURG

Month	Bessemer		Basic		No. 2 Foundry	
	1912	1913	1912	1913	1912	1913
January	$15.12	$18.15	$13.32	$17.35	$14.00	$18.59
February	15.03	18.15	13.28	17.22	14.01	18.13
March	14.95	18.15	13.66	16.96	14.10	17.53
April	15.13	17.90	13.90	16.71	14.15	16.40
May	15.14	17.68	13.90	15.80	14.12	15.40
June	15.15	17.14	14.11	15.40	14.22	15.10
July	15.15	16.31	14.38	15.13	14.38	14.74
August	15.43	16.63	14.90	15.00	14.85	14.88
September	16.86	.....	16.03	.....	15.63	.....
October	17.90	.....	17.18	.....	17.22	.....
November	18.07	.....	17.09	.....	18.00	.....
December	18.15	.....	17.45	.....	18.73	.....
Year	$16.01	.....	$14.93	.....	$15.28	.....

STOCK QUOTATIONS

COLO. SPRINGS Sept. 2

Name of Comp.	Bid.
Acacia	.02½
Cripple Cr'k Con.	.01½
C. K. & N.	.10½
Doctor Jack Pot.	.05½
Elkton Con.	.58
El Paso	3.10
Findlay	.02
Gold Dollar	.06½
Gold Sovereign	.02½
Isabella	.10½
Jack Pot	.04½
Jennie Sample	.05½
Lexington	‡.005
Moon Anchor	.009
Old Gold	.02½
Mary McKinney	.60
Pharmacist	.01
Portland	.95
Vindicator	.87
Work	‡.005

SALT LAKE Sept. 2

Name of Comp.	Bid.
Beck Tunnel	.05½
Black Jack	.08⅝
Cedar Talisman	.00⅔
Colorado Mining	.12½
Columbus Con.	.05
Crown Point	.01½
Daly-Judge	6.35
Grand Central	.55
Iron Blossom	1.20
Little Bell	‡.10
Lower Mammoth	.01
Mason Valley	6.00
May Day	.05½
Nevada Hills	.50
New York	.02½
Prince Con	.43
Silver King Coal'n	3.15
Sioux Con.	.02
Uncle Sam	.03½
Yankee	‡.08

TORONTO Sept. 2

Name of Comp.	Bid	Name of Comp.	Bid
Bailey	.06	Foley O'Brien	.15
Coniagas	7.00	Hollinger	15.35
T. & Hudson Bay	70.00	Imperial	.02
Timiskaming	.24	Jupiter	.18
Wettlaufer-Lor.	.16	Pearl Lake	.30
Apex	.01	Porcu. Gold	.07
Big Dome	12.00	Preston E. D.	.01½
Crown Chartered	.00⅝	Rea	.15
Dobie	.10	Swastika	.04
Dome Exten.	.07	West Dome	.10

SAN FRANCISCO Sept. 2

Name of Comp.	Bid
COMSTOCK STOCKS	
Alta	.05
Belcher	.23
Best & Belcher	.07
Caledonia	1.35
Challenge Con.	.07
Chollar	.01
Confidence	.10
Con. Virginia	.08
Crown Point	.20
Gould & Curry	.03
Hale & Norcross	.07
Mexican	1.05
Occidental	.70
Ophir	.21
Overman	.35
Potosi	.02
Savage	.11
Sierra Nevada	.05
Union Con.	.10
Yellow Jacket	.12

Name of Comp.	Bid
MISC. NEV. & CAL.	
Belmont	7.05
Jim Butler	.52
MacNamara	.12
Midway	.43
Mont.-Tonopah	1.10
North Star	.66
West End Con.	1.32½
Atlanta	.14
Booth	.01
C.O.D. Con.	.03
Comb. Frac.	.04
Jumbo Extension	.12
Pitts.-Silver Peak	.45
Round Mountain	.43
Silver Pick	.02
Tramp Con.	‡.01
Argonaut	2.00
Bunker Hill	1.75
Central Eureka	.16
So. Eureka	2.50

N. Y. EXCH. Sept. 2

Name of Comp.	Clg.
Amalgamated	77
Am. Agri. Chem.	44⅛
Am.Sm.&Ref.,com	67½
Am. Sm. & Ref., pf.	101⅝
Am. Sm. Sec., pf. B	84
Anaconda	37½
Batopilas Min.	1¼
BethlehemSteelpf	71¾
Chino	42⅝
Federal M. & S., pf.	37
GreatNor.,ore.,ctf.	34¼
Guggen. Exp.	46¼
Homestake	103½
Inspiration Con.	15⅝
Miami Copper	23¼
Nat'nalLead,com	48¾
National Lead, pf.	165½
Nev. Consol.	16½
Phelps Dodge	192½
Pittsburg Coal, pf.	84½
Quicksilver, pf.	3⅝
Ray Con.	19⅞
Republic I&S,com.	24
Republic I & S, pf.	88
SlossSheffi'd,com.	31
Sloss Sheffield, pf.	86
Tennessee Copper	32
Utah Copper	55
U. S. Steel, com	63¼
U. S. Steel, pf.	108⅝
Va.Car. Chem., pf.	98

BOSTON EXCH. Sept. 2

Name of Comp.	Clg.
Adventure	1½
Ahmeek	280
Alaska Gold M.	18⅝
Algomah	1⅜
Allouez	36¼
Am. Zinc	21¾
Ariz. Com., ctfs.	2⅞
Bonanza	.32
Boston & Corbin	1¼
Butte & Balak	1⅜
Calumet & Ariz	66
Calumet & Hecla	410
Centennial	13½
Cliff	1½
Copper Range	40
Daly West	2
East Butte	12½
Franklin	4½
Granby	68⅜
Hancock	18
Hedley Gold	30
Helvetia	¼
Indiana	5
Island Cr'k, com.	53¾
Island Cr'k, pfd.	84
Isle Royale	19¼
Keweenaw	1⅜
Lake	7
La Salle	3¾
Mass	2¾
Michigan	1⅜
Mohawk	43
New Arcadian	1¾
New Idria Quick	‡3⅝
North Butte	28½
North Lake	1⅜
Ojibway	.90
Old Dominion	51¼
Osceola	82
Quincy	61
Shannon	6¾
Shattuck-Ariz.	‡25¼
Superior	25¾
Superior & Bost.	2¼
Tamarack	29
Trinity	4¼
Tuolumne	.65
U. S. Smelting	36½
U. S. Smelt'g, pf.	47¾
Utah Apex	1⅞
Utah Con.	9¼
Victoria	1
Winona	1
Wolverine	44
Wyandot	.80

N. Y. CURB Sept. 2

Name of Comp.	Clg.
Barnes King	‡1⅜
Beaver Con.	.20
Big Four	.30
Braden Copper	6¾
B. C. Copper	2¼
Buffalo Mines	2⅜
Can. G. & S.	.22
Con. Ariz. Sm.	⅛
Davis-Daly	1⅞
Diam'field-Daisy	.02
Ely Con.	.07
Florence	.24
Giroux	1⅛
Gold Hill Con.	¾
Goldfield Con.	1⅞
Greene Cananea	34½
Greenwater	.04
Internat. S. & R.	‡115
Kerr Lake	3½
Keystone	‡2
La Rose	2⅝
McKinley-Dar-Sa.	1 11/16
Min. Co. of A. new	2¼
Motherlode Gold	‡.60
Nipissing Mines	8¾
Ohio Copper	1/16
Pacific Sm. & M.	1/16
Puebla S. & R.	2⅛
South Live Oak	‡2
South Utah M. & S.	⅛
Stand'd Oil of N.J.	373
Stewart	1⅝
Tonopah	4⅝
Tonopah Ex.	2 1/16
Tonopah Merger	.68
Tri-Bullion	1/16
Tularosa	3/16
Union Mines	.07
United Cop., pfd.	3
Yukon Gold	2

BOSTON CURB Sept. 2

Name of Comp.	Bid
Bingham Mines	4
Boston Ely	.51
Butte & Lon'nDev.	.37
Butte Central	.01
Cactus	.02
Calaveras	2
Chief Cons	1⅞
Corbin	1
Cortez	.20
Crown Reserve	1⅞
Eagle & Blue Bell	.95
First Nat. Cop.	2⅜
Houghton Copper	3⅞
Majestic	.31
Mexican Metals	.27
Moneta Porc.	‡.07
Nevada-Douglas	2½
New Baltic	.60
Oneco	.80
Raven Copper	.13
Rhode Island Coal	.01
Smokey Dev.	1
S. W. Miami	2
South Lake	4
Trethewey	.24
United Verde Ext.	.55

LONDON Aug. 26

Name of Com.	Clg.
Camp Bird	£0 18s 0d
El Oro	0 15 0
Esperanza	1 2 6
Mexico Mines	5 7 6
Oroville	0 6 6
Santa Gert'dis	1 0 0
Stratton's	0 1 9
Tomboy	1 6 3

‡Last quotation.